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We have a great mix this issue, bringing you features on creature creation and the effects of *First Man*, an inside look on the international hubs of CG excellence, as well as a tips collection to help you master the KeyShot renderer.

Rob Redman, Editor rob.redman@futurenet.com

SPOTLIGHT ON OUR CONTRIBUTORS



Pascal Blanché

Our cover artist this issue, Pascal is senior art director at Ubisoft Montreal with more than 20 years' experience in the game industry.

artstation.com/pascalblanche



Trevor Hogg

Regular feature writer Trevor Hogg returns this issue with an in-depth look into the making of *First Man*, the effects-laden space-race blockbuster.

www.linkedin.com/trevorhogg



Ian Failes

Vorld, and in this issue he continues his series following the work and processes of Double Negative.

www.vfxblog.com



Maya Jermy

Maya is a 3D artist and animator based in the UK. She started her career in 2012 remaking and animating characters for *Oddworld*. mayajermy.artstation.com



Ant Ward

Industry veteran Ant Ward explores
the considerations you need to
make when venturing into a career
as a freelance games artist.

www.antcgi.com



Mike Griggs

Mike Griggs is a 3D and visual effects artist with vast experience across the industry. This issue he teaches VR modelling with Gravity Sketch.

www.creativebloke.com







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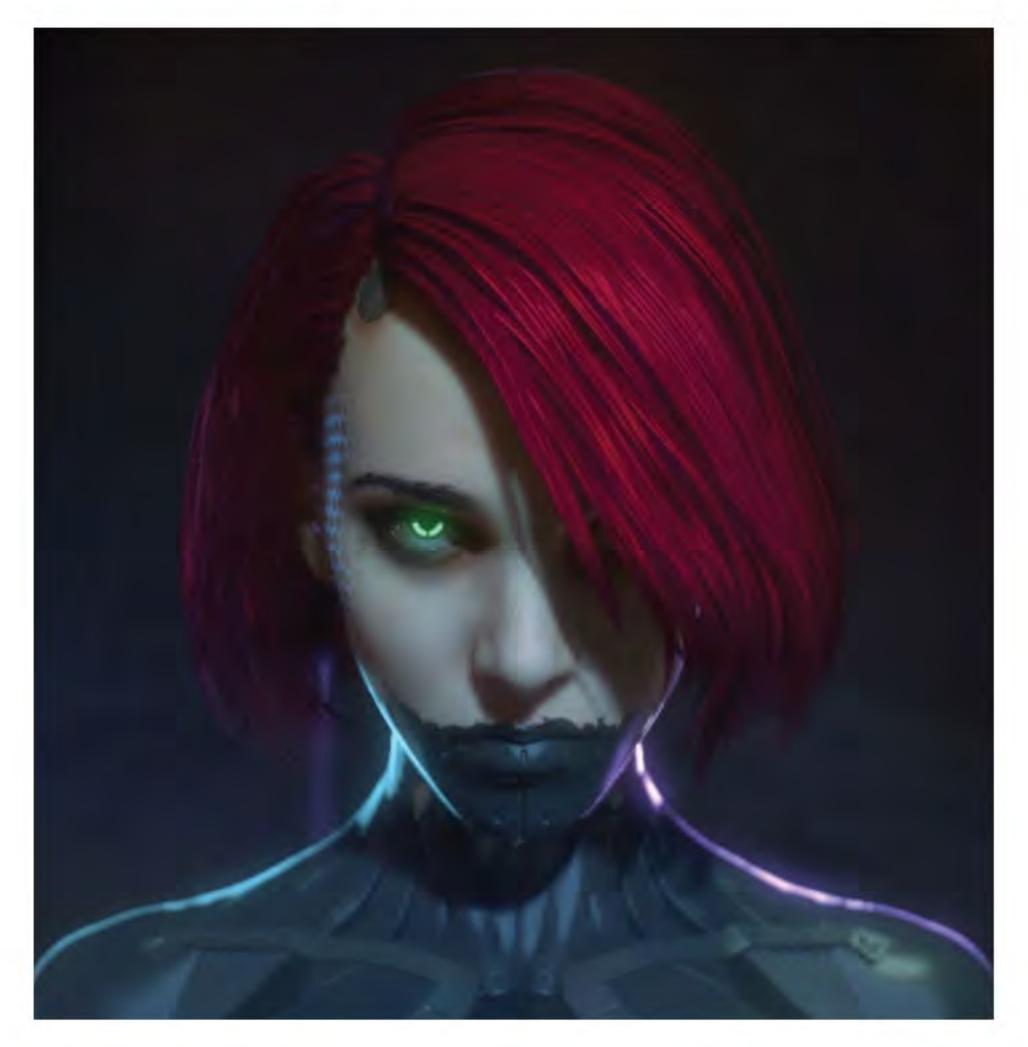
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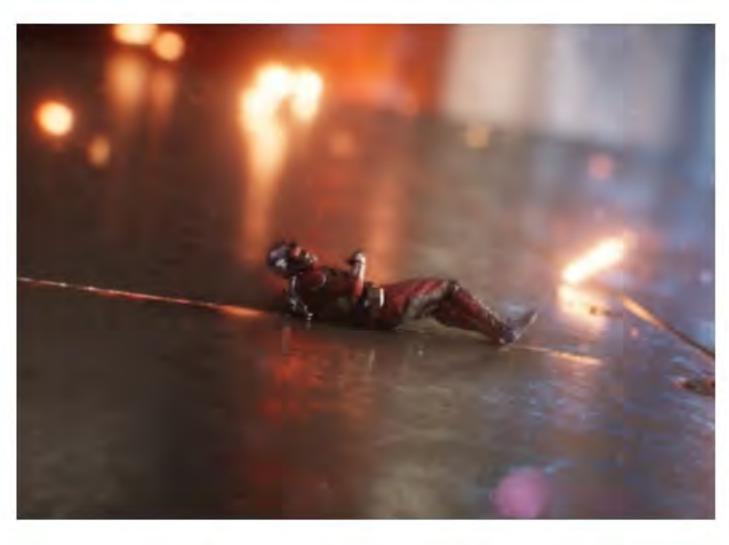
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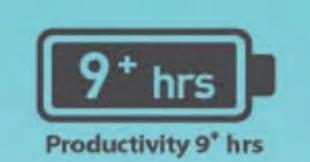
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ARTIST **Animation Lee** SOFTWARE ZBrush, 3ds Max, Maya, Unfold3D, Mari, Mudbox, Substance Painter, Knald, Marmoset Toolbag

"I wanted to make something like EVA, Ghost In The Shell and The Last of Us. Recently I've been liking vivid cartoon images," says Animation Lee. By day he teaches 3D art and by night he is a hip-hop dancer, and this image was created over one months' worth of free time.

"I've only done normal characters before, and I haven't done the appearance of a person's skin being torn apart," he explains.

"My method is to use ZBrush on the first-level model, export to 3ds Max and change the topology again, giving it a thickness, then I used ZBrush's project function to complete details with mask."

When asked where he finds inspiration, he says: "In the world you see first, the world others see second. I look at other people's work, play games, go for walks, watch movies, or go to the zoo. They're all sources of inspiration."

artstation.com/animation leejun0209





JOAN OF ARC (RULER)



ARTIST
Bora Kim
SOFTWARE

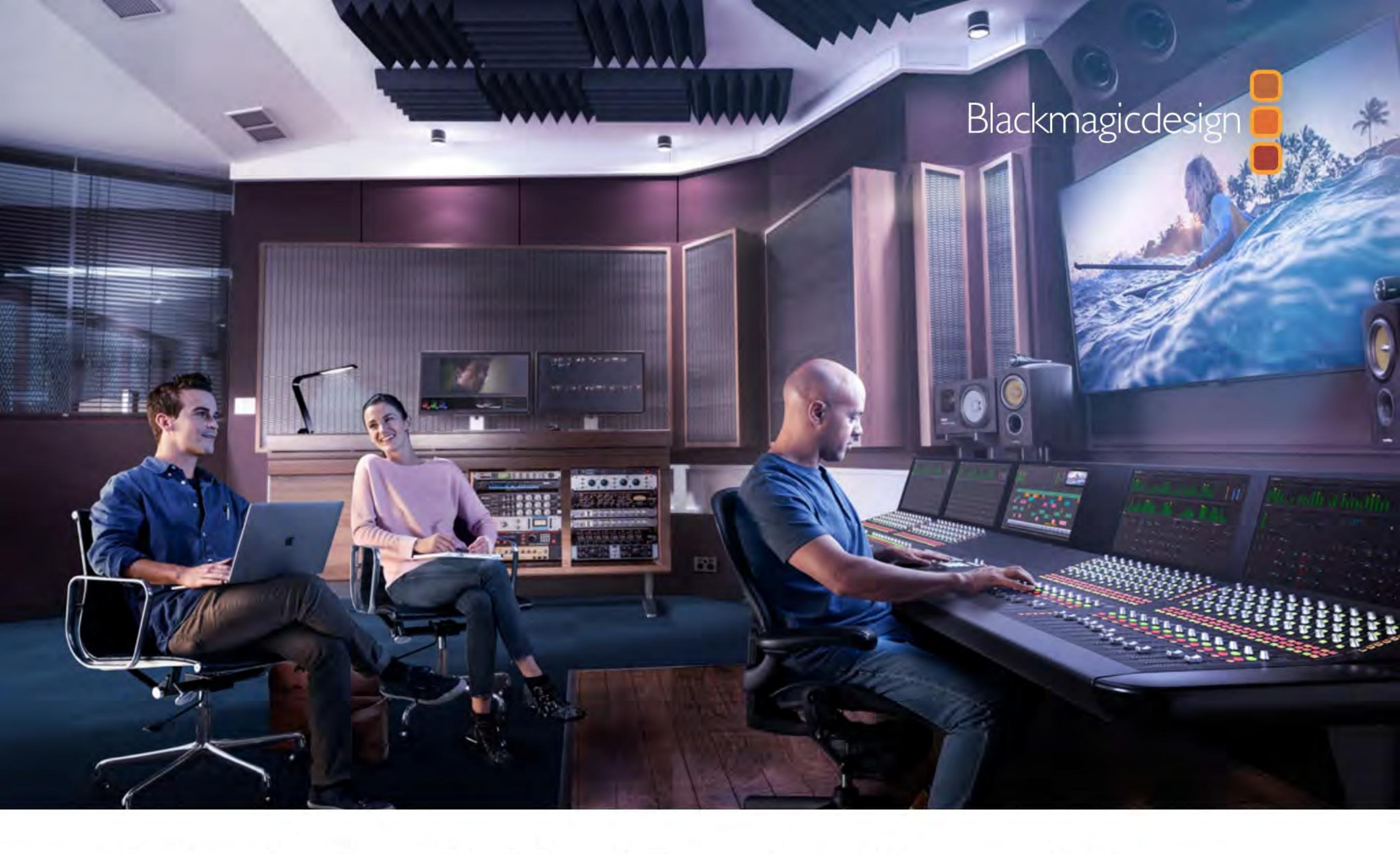
3ds Max, ZBrush, Substance Painter, 3D-Coat, Marmoset, Photoshop

"I love the texturing process, it's when I feel the character is coming to life," says 3D artist Bora Kim. In her day-to-day work she does modelling, animation and a variety of other work across 3D animation, VR and games.

"I always make a plan and concept of the work before I start," she explains. "I consider any new skills that I want to challenge and how I'll apply them. Modelling is done in ZBrush and 3ds Max, sometimes I use Marvelous depending on the shape. I use 3D-Coat for topology and Substance or Photoshop for texturing. Finally, I put the character into Marmoset." The falling petals seen in the background were created using the particle effect inside 3ds Max.

Bora set aside three months to create this image alongside her other work commitments.

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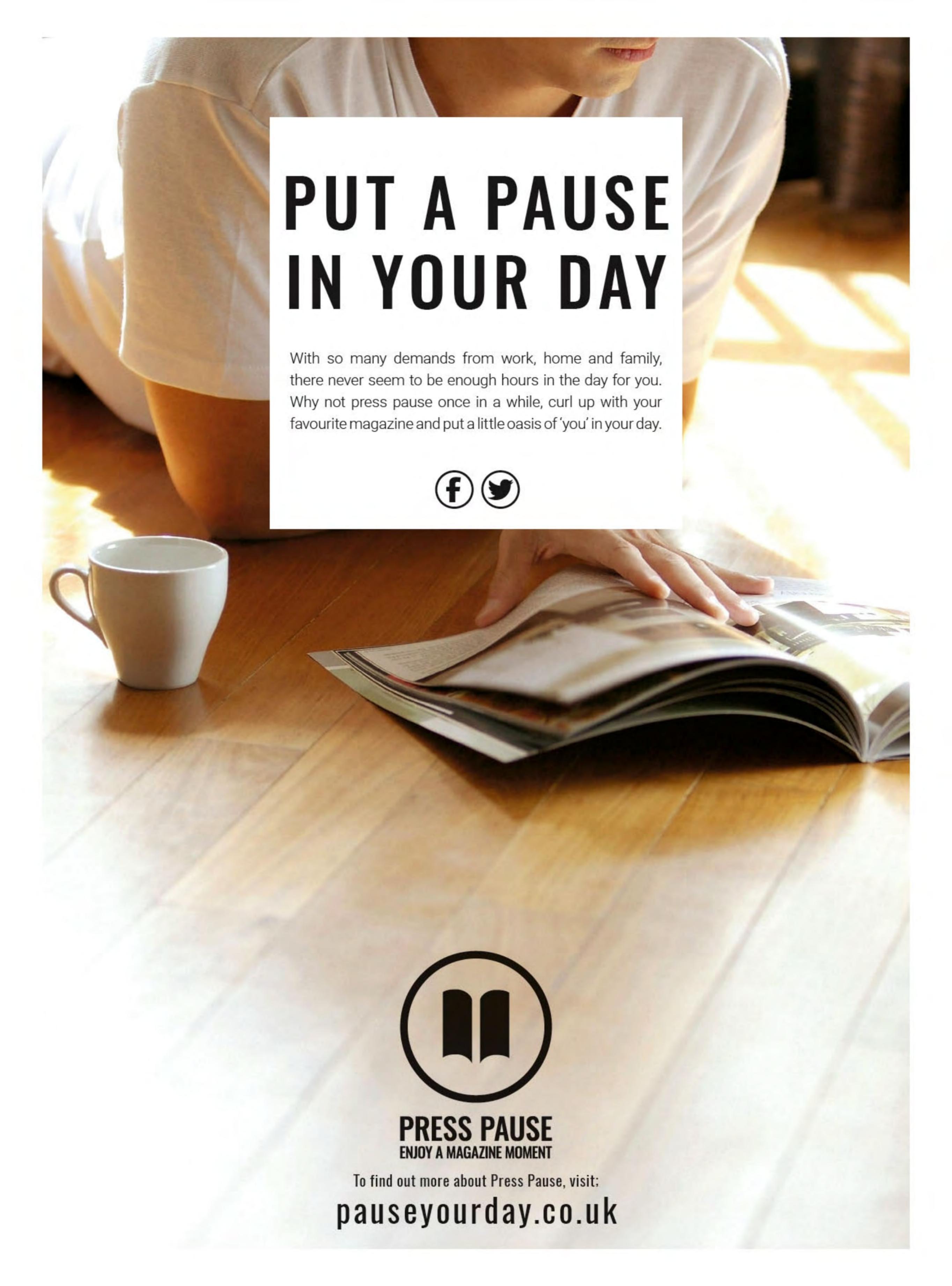
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MARIO AND YOSHI



ARTIST Carlos Adrian Gonzalez VIllagomez SOFTWARE ZBrush, Maya, Arnold Renderer, Yeti, Photoshop

"Before I started freelancing as a character artist, I worked at a Mexican pharmaceutical company called Genomma Lab as a 3D generalist doing animations for their products, so I have experience in every aspect of the 3D pipeline," says Carlos Adrian Gonzalez VIllagomez. This particular image was based on a CreatureBox concept called Plumb Life.

Carlos always begins his process by sketching in ZBrush. He continues: "Then I stop for a moment and take a quick rest; it's important to reset your eyes so you can have a fresh look at your model and improve it. After the sculpt is finished I move in to Maya to retopologise, and make the UVs. After that I start sculpting the fine detail in ZBrush, then export texture, cavity, bump and displacement maps for look dev in Maya. Finally I do compositing in Photoshop."

carlosgv.artstation.com



WARRIOR OF THE SHADOWS

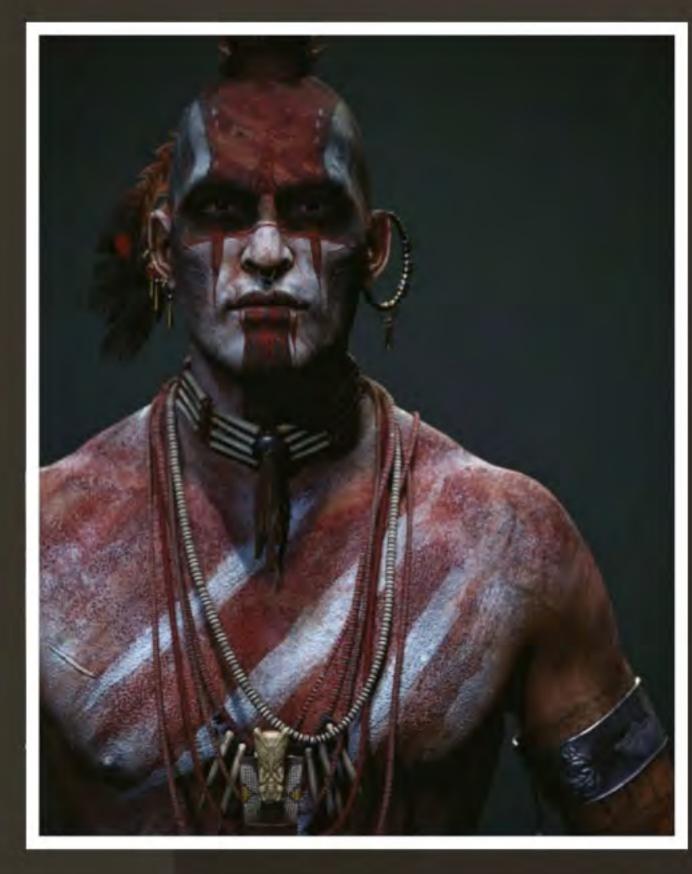


ARTIST Aidin Salsabili SOFTWARE ZBrush, Maya, Marvelous Designer, Substance Painter, Marmoset Toolbag

"I loved creating the character for this project; studying the Native American tribes and culture was something special," explains freelance character and prop artist Aidin Salsabili. "I gathered a ton of reference with lots of details. It was essential to make the characters feel soulful. Accurately mimicking the Native American warrior's make-up was very important."

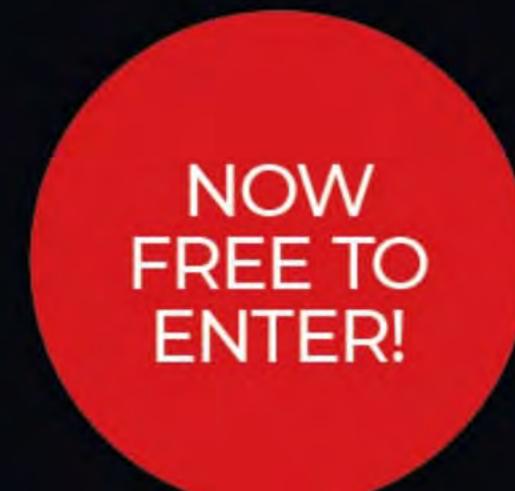
The image was created as part of ArtStation's Wild West Challenge, which gave artists two months to submit their work. In order to improve his rendering, Aidin has been studying lighting and composition. "I suggest black and white movies for everyone. They are incredible for bettering your understanding of lights, shadows and composition," he says.

artstation.com/aidinsalsabili







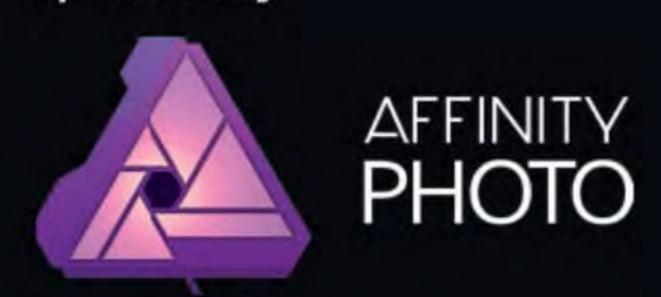




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HOTSPOTS



3D World talks to creators in CG hubs around the world

to discover how these places came to be

and if they're still relevant in 2018



very 3D artist has an idea of where in the world they'd like to be, whether it's London, Berlin,

Vancouver or Los Angeles. But has anyone ever asked how these places came to be the promised lands for aspiring creators, and if they're still relevant in an age where the internet rules supreme?

3D World has assembled a variety of companies and creatives to discuss their respective communities and the concept of industry hotspots. VFX veterans Rise FX in Berlin, Riot Games character artist Blair Armitage in LA, CraveFX in Singapore, and DNEG in London and Vancouver.

"Berlin's still a relatively young community, but that doesn't mean we aren't up to speed or as advanced as other places," says Rise VFX supervisor Jonathan Weber. He has been working at Rise for 11 years, joining shortly after the studio was founded in 2007. His most recent credits include Avengers: Infinity War, Black Panther and Disney's upcoming live-action adaptation of Dumbo.

"The industry here grew at a steady rate," he explains. "There aren't as many companies in this region compared with cities like London or Montreal. Rise however was one of those that grew alongside the industry and remains one of the original. With the increase of film production in the area, the amount of visual effects projects coming to Germany has really taken off in recent years."

When asked how Berlin came to be such an important part of the global CG community, Weber attributes it to several factors. First of all is the abundance of nearby universities and educational programs for digital art, bringing a wealth of fresh talent through the area. He continues: "Cities like Munich and Stuttgart help by continuing to grow by passing on individuals with the necessary knowledge and expertise. There's other incentives such as the recently updated state-sponsored tax rebate programs. It's also still an affordable city, so if you're deciding between here or a city like London, which has a larger number of artists and higher living costs,



"THERE ARE SO MANY ARTISTS HERE IN LA, FROM INDUSTRIES THAT I HAD NO IDEA ABOUT IN THE UK"

Blair Armitage, character artist, Riot Games

Berlin will continue to be the better alternative."

Few studios are as well placed to assess London's place in the global CG community as DNEG, which was founded in the city back in 1998. According to their Vancouver facility's head of CG, Stuart Farley, it was formed by "a group of people who had been working together in visual effects, and aspired to produce visual effects of the highest calibre for feature films."

Farley goes on to explain that over the ensuing two decades DNEG have continued to push themselves creatively and technically, something that has allowed them to thrive in the crowded London scene. He continues: "We try to remain focused at all times on the other important things that drive us: award-winning visuals, relationships with the very best

Above: A still from German crime-drama series *Babylon Berlin*, for which Rise FX provided VFX

Since 2007 Rise FX have opened three more branches in Munich, Stuttgart and Cologne

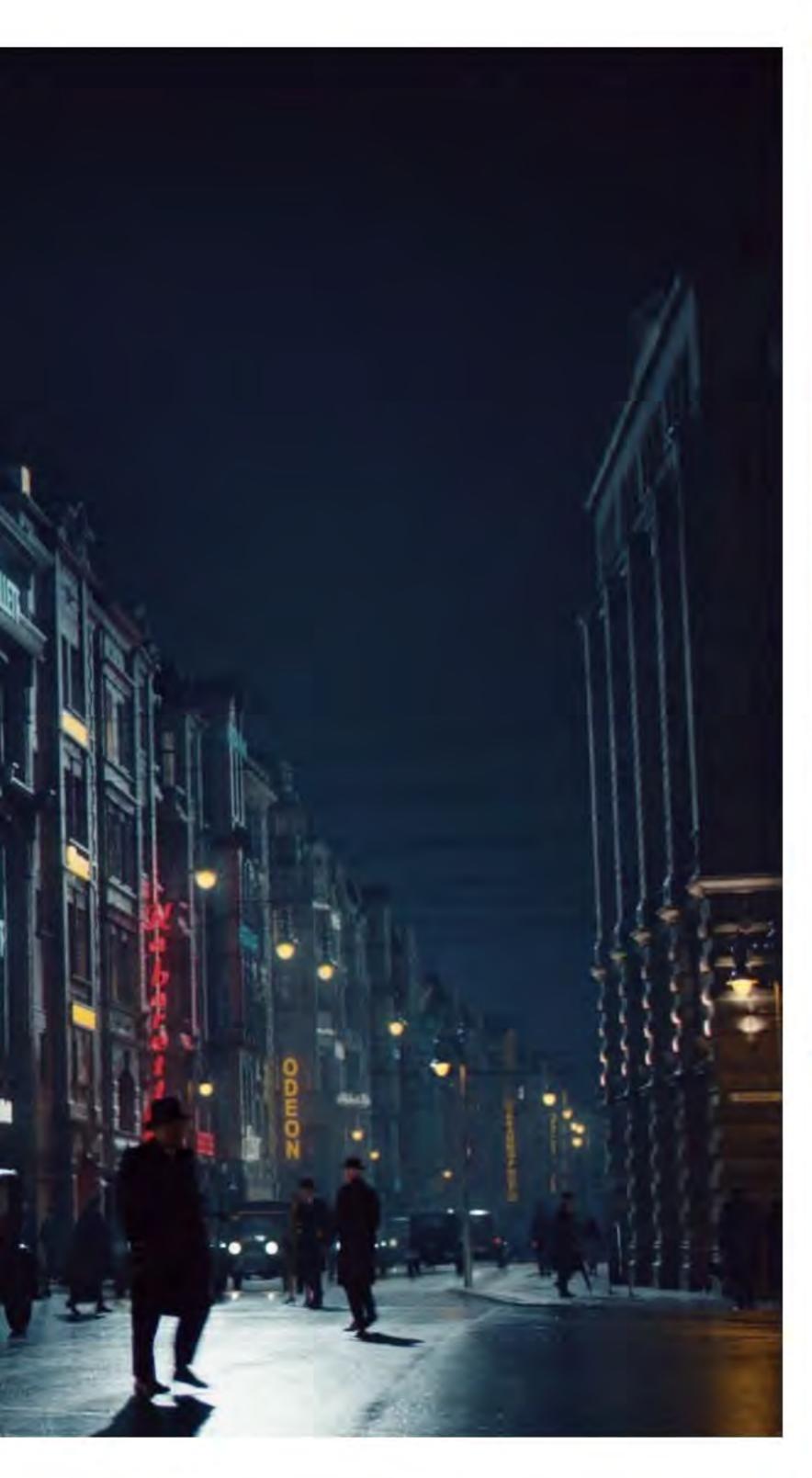
Jonathan Weber says communities in Eastern Europe are getting more recognition and beginning to make an impact internationally

creatives, collaboration with upcoming filmmakers and pushing storytelling beyond the limits that audiences are used to. We hope this focus has given us a special place in the community."

Since 2014 DNEG have opened a number of facilities around the world, one of which is in Vancouver. "It's proven itself to be an important hub for the VFX industry," explains Farley. "DNEG was a natural fit for this environment. We wanted to open our doors to the wealth of talent here and bring the culture of DNEG to Vancouver."

Discussing how Vancouver came to such fruition in the industry
Farley says: "It offers a diverse workforce and an established backbone of shoot services.
There's a great range of stages and locations." The abundance of film production has attracted many of





the VFX industry's heavy hitters, which in turn brings a wealth of talented creators to the city.

Originally hailing from West Yorkshire, character artist Blair Armitage relocated to the bustling CG hotspot of Los Angeles for a role at Riot Games, after working for several years in the UK and freelancing in Japan. "There are so many artists here in LA, from different industries that I had no idea about in the UK," she explains. "I've met people from the animation industry and learned all about their pipelines and skill sets. My view as a game artist was very narrow and hyper-focused, being here has inspired me to learn more outside of that."

Long-established studios like
Disney, Dreamworks and Blizzard,
to name just a few, first attracted
the diverse range of talent that
has made LA such a crucial part
of the global community. But what
makes it unique from the host of
other hotspots? "There's tons of
learning to do here. Lots of great
opportunities for artist meetups,
E3, ZBrush Summit, Gnomon
Workshop events, and CTN



Above: Some of CraveFX's more exciting projects include SkyAvenue at Resorts World Genting, and Google ShadowPlay for the 2018 World Al Conference in Shanghai

One of CraveFX's
3D projects, a *Brief History of Time*,
was featured at
Pause Fest 2016

animation eXpo," says Armitage.
"I've met people who have been
working in LA their whole careers,
which is odd to me as I feel like a
lot of young British artists are more
nomadic due to the nature of the
industry." Armitage also expresses
the diversity of the community in
LA, with artists from a wide variety
of backgrounds and experiences.

Animation and post-production studio CraveFX have been part of Singapore's CG community for the last five years. "Our directors Joshua and Davier met as students in university and worked together as project officers for a year after they graduated," says a spokesperson for the company. "Like any other fresh graduate, their dream was to land a comfortable full-time position in a large organisation. But after some time freelancing, they realised they had something unique that they could bring to the industry. That's when they struck out on their own. We've since grown from a twoman outfit to a bustling studio with more than 30 people."

"The government played a big role in giving the sector an early leg-up, with initiatives and grants to draw animation studios with a global presence into the country," says CraveFX on the subject of how Singapore became such a focal point for the industry. There's



also an abundance of educational institutions that offer courses in motion graphics or animation.

"This helps with the nurturing of talented artists and animators," adds CraveFX.

The recipe for a global CG hotspot appears to be a mixture of major studios, educational institutions and government initiatives. However, there still remains the question of whether or not physical locations remain relevant in a time when everyone is more connected than ever, and budding artists can become established members of the community from their bedroom.

Stuart Farley asserts that the idea of hotspots isn't at all outdated: "Hotspots like Vancouver have proliferated because of the wealth of creative talent in the community, and because our clients recognise the advantages of placing work in different geographical locations. The creativity between studios is fed, and an environment is

Armitage describes
Riot Games as
an incredibly
comfortable place to
work and somewhere
she feels very lucky
to spend her daily life

Left: Armitage's
Final Fantasy 7
fan art, which she
started back in
2016 and gradually
built throughout her
spare time

nurtured where everyone benefits, creating a richer community."

"There will always be hotspots," argues Rise FX's Jonathan Weber. "Yes, it is getting easier and easier to work from a home office setup. That however is still limiting, especially if you want to be involved in larger productions that have more opportunities to further develop your skills. If you are just starting off too you may not be able to obtain and work on the industrystandard software, and wouldn't be familiar with the pipeline developments that make working between multiple departments more efficient."

He continues: "All this doesn't mean you can't learn at home, but as a functional studio you need to have a physical location that has the hardware, software, licences and more to further yourself with. Not forgetting what you may pick up from working with artists from a variety of backgrounds and experience levels."

Sara Sarmiento, Rise FX's line producer, shares the same view. She explains: "My experience has shown me that certain tasks can only be achieved in a team setting, under a supervisor's direction. The greater and more demanding tasks become, whether it's 3D or otherwise, the more you need others to help realise the end result. That requires clear and efficient dialogue between departments. Hotspots will continue to exist, but that will allow freelancers to try out places all over the world."

CraveFX take a slightly different view: "The world is shrinking, particularly the animation sector. Unlike traditional industries such as manufacturing, it's less reliant on economies of scale and proximity. Because of our mobility, we don't have to be clustered in one place. Good animation work is universal and can come from anywhere in the world."

For Blair Armitage the best place in the world for a 3D artist to be is anywhere that they can bring a laptop or a tablet, with good coffee and internet. However, she still sees some worth in the concept of industry hotspots and the studio environment. "In my opinion you can't beat face-to-face relationships," she explains. "It's much nicer to see someone's face when you can interact with them with zero lag. Personally I find it easier to build trust with someone in real life, even if I originally knew them from the internet."

"Online mingling is really important, but I would still encourage young artists to attend community events, to have fun and enjoy the vibe, make friends and connections, and see if this is a community that you want to be a part of. It's also important to find out if you can see these people as your potential future co-workers."

So it appears that the age of the industry hotspot isn't over just yet and there are still a multitude of reasons for studios to remain in clusters around the globe, whether it be for financial incentives, or the proximity to emerging talent. Plus, one particular aspect that all our experts seem to agree on is that there's no substitute for the wealth of interaction that a studio environment can provide.

"MY EXPERIENCE HAS SHOWN ME THAT CERTAIN TASKS CAN ONLY BE ACHIEVED IN A TEAM SETTING"

Sara Sarmiento, line producer, Rise FX





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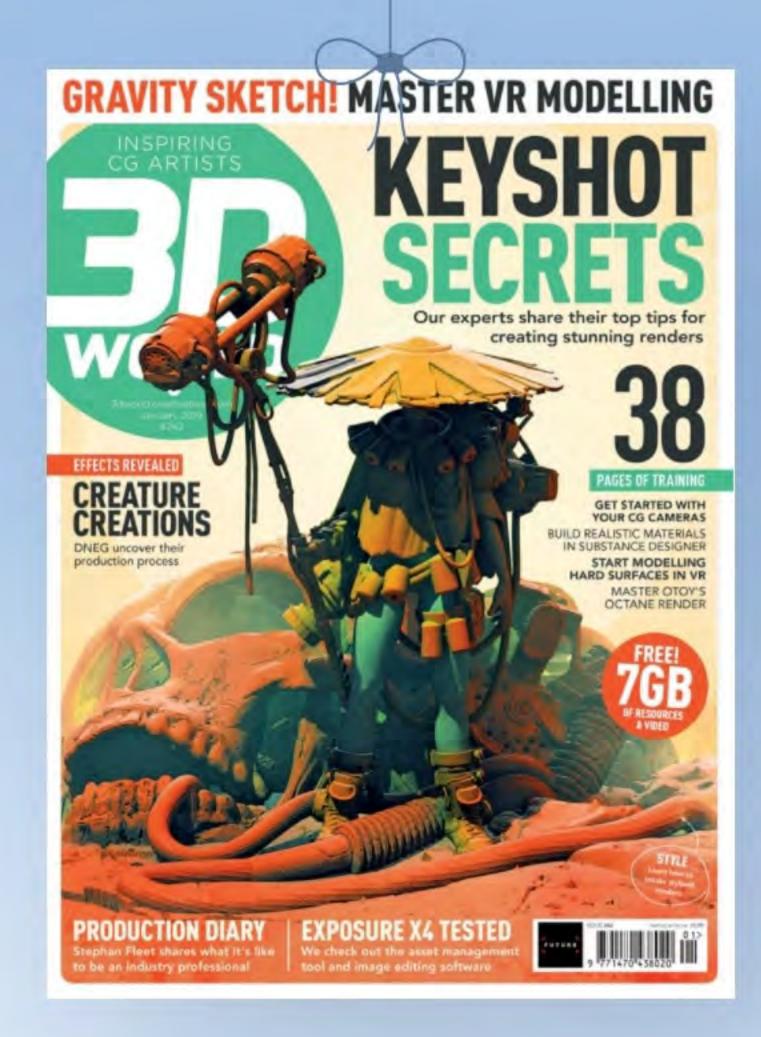


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FIRST-HAND ENCOUNTER

Trevor Hogg was over the moon about meeting the production team responsible for First Man at the 43rd Toronto International Film Festival...

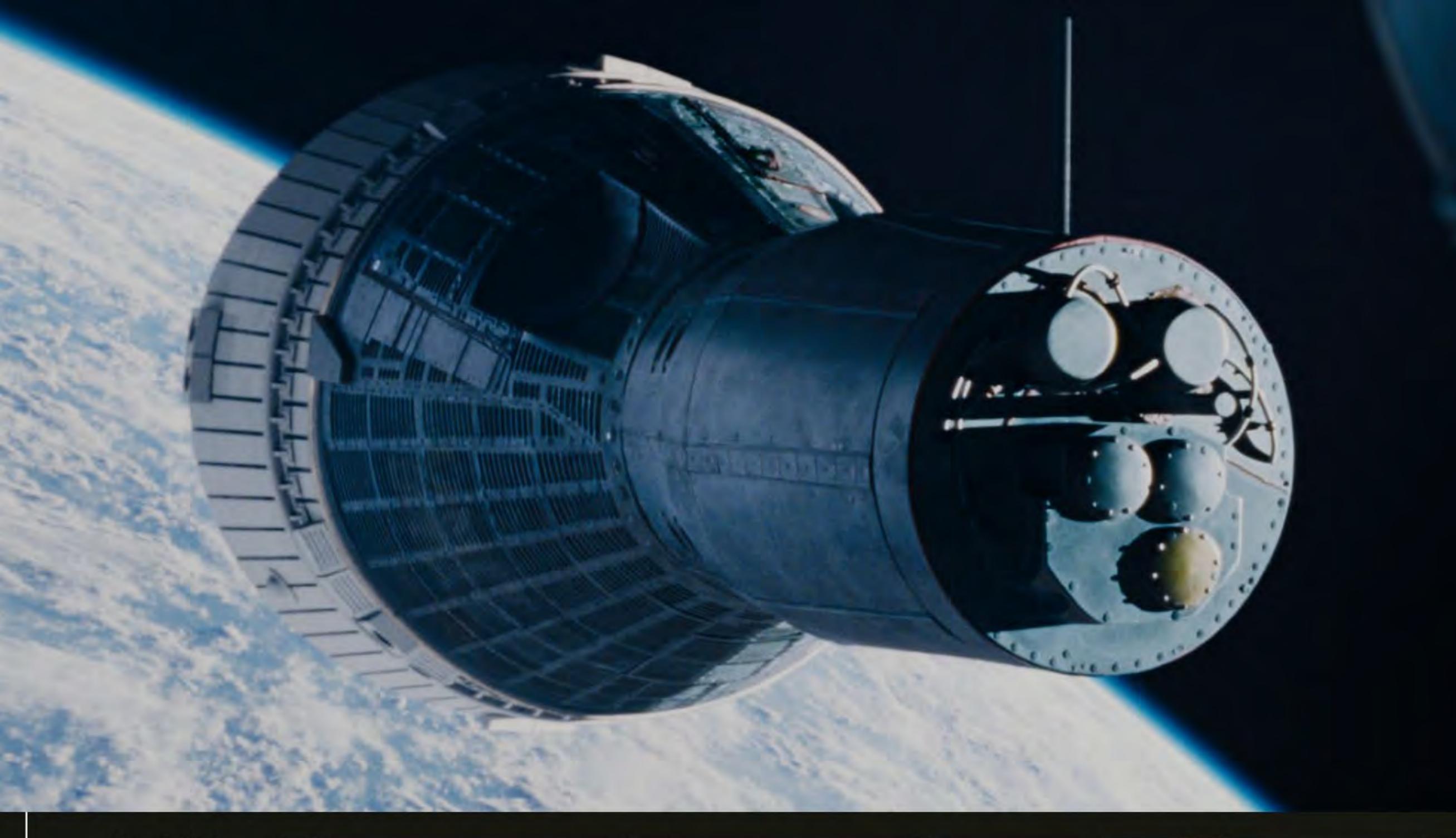


fter chronicling the trials and tribulations of an aspiring Jazz drummer in Whiplash and making the

romantic musical La La Land, filmmaker Damien Chazelle embarked on a new frontier with First Man, a biopic about American astronaut Neil Armstrong who was the first human to walk on the moon. "When I first joined the show, Damien gave me a PDF file which was 300 pages of what the movie was going to be," recalls visual effects supervisor Paul Lambert (Blade Runner 2049). "It was like seeing into the mind of one of the top directors in the country. He had made these storyboards cut to the music [scored by composer Justin Hurwitz] that you hear in the film."

The mandate was to rely on practical effects that would be digitally augmented, which suited the 'new technology, old techniques' mantra of production designer Nathan Crowley who worked on *Interstellar* and *Dunkirk* with the like-minded Christopher Nolan. "The films that I've made prior to this were incamera, celluloid and immersive;

that's what Damien wanted," remarks Crowley. "It's old-school filmmaking where you use a fullsize cockpit in the foreground, go to miniatures for midground and CG for distant stuff and planets. You use that methodology and hold to it. You always start with something that is built in reality and come out of the edit with it. In-between you use all of the different methodologies to build an immersive experience." For editor Tom Cross (Hostiles), the in-camera effects assisted with the editorial process. "When we had early screenings for the studio or friends and family, the shots were that much further along because a lot of the effects were in progress as opposed to starting with greenscreen and CG that didn't exist." Each sequence had different issues. "When we had interior shots, let's say of the X-15 or Gemini 8 and Apollo 11 capsules or LM [Lunar Module], we used an LED screen which was 35 feet tall and 60 feet across that had CG background content," remarks Lambert. "It gave us all of the interactive light. In the X-15, we even got all of the reflections in the eyes of Neil Armstrong [Ryan Gosling], which would have been tricky to do shooting with greenscreen." Calculations were made by cinematographer Linus Sandgren (American Hustle)



Above: Finished composite of the Gemini 8 capsule approaching the Agena. In post the team removed the gimbal, updated the CG background Earth and added a CG extension to the capsule. Additional light was also added to the underside of the capsule to compensate for the physical limits of the LED screen





"18 3D PRINTERS RAN LITERALLY 24 HOURS A DAY FOR SIX MONTHS"

Nathan Crowley, production designer

> in order to get a realistic depth of field with the LED screen. "I figured a good distance would be 30 feet because that's close to infinity on a lens, so technically if you rack focus on the screen then the Earth will be out of focus in a realistic way. When you rack focus

to the character then the screen

naturally falls off out of focus. On top of that we had a sun which was a 5K that travelled around a circular track on a scissor lift."

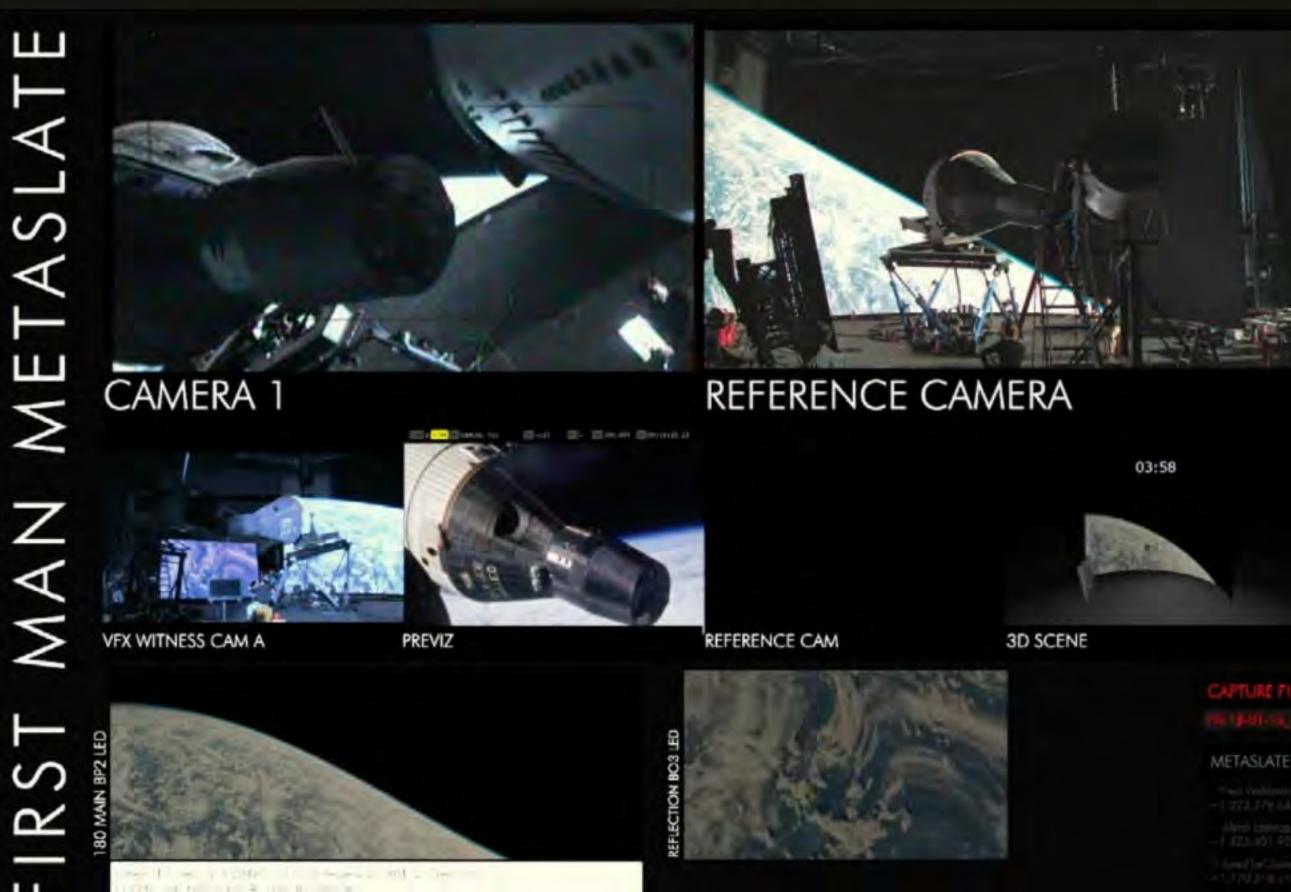
Miniatures and bigiatures
were constructed of the various
spacecraft such as the CSM
(Command/Service Module) and
Saturn V rocket. "The problem
is that there are no miniature
companies left," explains Crowley.
"I retrained myself years ago in
3D so that I could speak to DNEG.
We had 18 3D printers in the art
department which literally ran
24 hours a day for six months so
we would burn them out." BigRep
lent two metre by metre print beds
which enabled the printing of an

Apollo 11 capsule in one go. "I hired Ian Hunter of New Deal Studios to do the final finishes and to organise the miniature shoots because he's an expert at that." Some digital augmentation was needed. "With the full-scale LM, which is a huge beast, having the legs there as well was problematic for camera moves," states Lambert. "We had the top section filmed in-camera and then we added CG legs."

In most cases the gantry
would have been built on a
soundstage with greenscreen.
"We built the top gantry, White
Room and capsule 150 feet up
on a steaming coal plant so you







get this atmosphere and horizon line," remarks Crowley. "We had to connect all of these pieces with real locations because that would immerse the audience in the event." The elevator scene incorporated a plate shot at Cape Canaveral at dawn and a digital version of the Saturn V rocket. "That was projected onto this huge LED screen outside the window as a panorama," states Sandgren. "The elevator was on a gimbal. We scratched the window and made it dingy. Outside Nathan had beams coming down so we could have the entire journey including opening the doors and having the astronauts step out."

A practical location outside of Atlanta served as the landing site on the moon. "Nathan Crowley and his crew found this quarry which we dressed to be as close as possible to the original landing site," explains Lambert. "With it being a working quarry, the sides had mounds of gravel and different things which we cleaned up in post. Having a set where you do 360-degree moves with an IMAX camera meant that you get to see absolutely everything. We tried our best on the day to clean up the set and sweep different areas, but there was always going to be telltale signs of manmade lines needing to be painted out.

There was also an extension to the horizon. In nearly every shot the astronauts have the sun visors on, which is like having a chrome ball on set so you always see the IMAX camera and the crew. A lot of the work was to create a digital version of the moon and to remove the IMAX camera."

Avoiding the use of greenscreen and bluescreen on *First Man* had a particular significance to Lambert. "Ten years ago I invented the Image-Based Keyer inside of Nuke which is used in every single movie right now to pull a bluescreen and greenscreen; for me to purposely try to avoid it there's a certain irony in that! I've never been on

Above: Every shot using the LED screen generated a 'metaslate' output. This included both main cameras' views, witness cameras' views and content feeds, all time coded. This was an invaluable reference in post

None

Brightness BO3

Stage 3

LED Profile

12-20 06:35

Camera & Slate Timecode

Content Server Timecode

Time of Day

00:00:00:00

00:03:59:02

2018-01-15 22:28:41

• FEATURE

First-hand Encounter

> a project where the focus was to come up with techniques on the day or in preproduction to make everything as believable as possible. The fact that we came up with methods to shoot in-camera effects helped to make sure that First Man felt as one cohesive film."

Linus Sandgren was a fan of the Cinéma vérité documentary style adopted for the camera work in the film. "Often times outer space in movies is so surreal and amazing that it's not as if you experience it yourself. This was about trying to make it feel like you were actually there during the 1960s in this tiny fragile craft."

BEING CONTENT

Over 90 minutes of content needed to be produced for the LED screen that surrounded the practical builds of the X-15 cockpit and capsules for the Gemini 8 and Apollo 11.

"It did catch us off guard as to how much content we would have to produce for the LED screen," reveals Paul Lambert. "We relied heavily on Terragen for our environments. For the full CG flying through the clouds in the X-15 it worked wonders and we added to it as well. When Neil Armstrong is coming down through the clouds and is about to land he goes over the ridges into the lakebed. They were helicopter plates which we shot and stitched together. We had to come up with a methodology that [enabled] us to replicate the background content on the screen in post in order to add extensions to it or change stuff."

Initially the setup was for shotby-shot work based on storyboards, but in the end entire sequences

needed to be created. "We started off rendering front and side views knowing that in the storyboards it was either a front or

side view," explains

Lambert. "But what became quickly apparent was if we rendered full 360s, like a full spherical image and

ran that





Top (left): Frame of 70mm NASA archival footage of Apollo 14 launch

Top (right): "To create a more cinematic visual we reframed the Apollo 14 footage, cleaned it up and then extended the sides with CG smoke and sky to match," says Paul Lambert through the system, we were then able to do interactive moves on the day. For the approach and landing on the moon in the LM [Lunar Module], we rendered 8,000 frames. We would meet two hours before the setup of the shoot with filmmaker Damien Chazelle and everybody involved, play through, figure out exactly where we would turn and cue points, and once we had that worked out Damien would then sit with the actors using that as a basis."

Managing the resolution of the imagery was a major issue. "To fully resolve that screen properly with the 180 degrees would have required 10K images, so we had

to come up with creative ways," remarks Lambert. "We knew whereabouts the camera was going to be, so we had areas in the screen which were a higher resolution in relation to other areas on the screen. The idea being if the camera saw the screen at that particular view, that would be at the correct resolution with everything around it being a low resolution, but you retained all of the interactive light and reflections. That bit was super important because we were dealing with helmets and visors which are like curves, so you would always catch something off to the side of the screen."









Left: A frame of
the gantry building
spherical image
on the LED screen.
Used while shooting
the interior of the
Gemini capsule
for Neil's point
of view through
the window

Far left: This is original plate photography of the partial gantry and partial Saturn V built on a coal factory rooftop outside Atlanta

Next to it is the final composite of the Gantry and Saturn V. The background was extended using modified helicopter plates of Cape Canaveral

WE HAVE LIFT-OFF!

Digitally enhanced archival NASA footage was incorporated into the launch of the Apollo 11. Various engineering cameras captured every Apollo launch in case there was an accident or explosion; however, none of the footage was processed as nothing went wrong, with the exception of the fire on the Apollo 1.

"A lot of the footage was on 70mm NASA stock which is no longer made and couldn't be viewed," remarks Paul Lambert. "FilmLight had created a sprocketless Beta scanner which was ideal. We sent the footage and they did various tests to try to get all of the colour back in the frame and what came back was fantastic." Real archival footage was used for the launch of the Apollo 11. "There is one shot that is a wide of the Saturn V rocket just igniting and you see the plumes of smoke on either side. That actual image is the original 70mm footage of the Apollo 14. We scaled it into a more cinematic framing and added CG smoke on either side."

TO THE MOON

The historic and iconic moon landing was shot in a quarry situated in Georgia. "Tranquility Base was 500 feet by 500 feet with a full-size LM [Luna Module], and

the greensman put all of the rocks and dug all of the littler craters," explains Nathan Crowley. "The acreage behind had slowly rising embankments to hide all of the trees so we could get from grey to night-sky black. Paul Lambert then took those berms and put the distant stuff of the moon in."



Paul Lambert, visual effects supervisor



Originally, the plan was to use two stacked 100K SoftSuns to represent the sun, but the shadows being cast were not harsh enough. "I asked David Pringle at Luminys, 'What would it take to make a 200K?" recalls cinematographer Linus Sandgren. "David built 200K SoftSuns which is what we used for the big wide shots." Unfortunately, both experimental lights blew up doing the principal photography so had to be replaced with two stacked 200K SoftSuns. Ensuring continuity became the responsibility of visual effects supervisor Paul Lambert. "What we did in post was sharpen up the shadows so that there wasn't any discontinuity between the two setups."

SPACIOUS SOUND

Rockets, lion and elephant roars, musical instruments and astronaut helmets were utilised in the sound design, mixing and dialogue editing with the versatile Adobe Pro Tools.

When SpaceX launched the Falcon Heavy on 6 February 2018, the event was recorded by the *First*

Man production team to be used for the Saturn V rocket. "We placed mics 300 or 400 yards away and at different distances so that way we could capture the ignition of the launch and different parts of it," states sound designer, re-recording mixer and supervising sound editor Ai-Ling Lee (Deadpool). "I repurposed the sonic boom when Falcon Heavy re-enters the atmosphere and used it in the X-15 sequence. We also went to JPL [Jet Propulsion Lab] and recorded in the acoustic chamber – which is powered by nitrogen gas – to create a sonic environment to simulate a launch environment."

A NASA educational film about going to the moon needed to be made that appears in an astronaut training session scene. "We listened to a lot of voices to find someone who sounded period for all of the newscasters," remarks supervising sound editor Mildred Iatrou Morgan (*The Tree of Life*). "We had to edit it a certain way so that it had the same kind of cadence. Jon Taylor [re-recording mixer] added a futz to it and even varied the speed so there was a warbly sound."

A historic conversation was a proud moment for the veteran dialogue editor. "We're familiar with Neil Armstrong saying, 'One small step for man.' The lines spoken by Neil and Buzz on the moon were performed by Ryan Gosling and Corey Stoll, who listened to the original recordings so that they could use the same cadence and rhythm. I tweaked it even more and someone said to me recently that they thought it was the original. I was happy to hear that!"

Left: A large-scale
lunar module
build with CG
leg extensions
approaching the
CG moon

Below: Final composite of Neil standing in front of a crater on the moon. Neil throws his daughter's bracelet into the crater. The crater was deepened to give the illusion of a black hole

Bottom: Final composite of Neil on the moon. The camera and crew were removed from the visor reflection. Light fall-off was extended to mimic the sunlight on the moon in addition to set extensions







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PART 2

HOW DNEG DOES...

CREATURES

Part 2 of **3D World**'s special series on DNEG jumps into the studio's renowned creature work

he robot Jaegers and massive Kaiju monsters in Pacific Rim: Uprising. Giant and small versions of Ant-Man in Ant-Man and the Wasp. The alienesque symbiotes in Venom. The crazy critters of Annihilation. Wade Wilson's baby legs in Deadpool 2.

That's only a small portion of the many incredible creatures and characters that visual effects studio DNEG has made for some of its recent projects, many of which are some of the biggest blockbusters of the year. In this second part of the insider series on the studio, **3D World** finds out more about where creature work sits in the DNEG pipeline, with highlights from *Ant-Man and the Wasp* and *Deadpool 2*.

FEATURES OF THE CREATURES TEAM

It's the job of the creature team at DNEG to take models made by the studio's build department and construct a set of rigs around them. Animators give the model a primary performance, with muscle, skin, costume and hair rigs made by the creature team providing secondary movement and final output geometries.

Since so much of that work involves re-creating natural human and animal traits, "creature artists need to have an excellent

understanding of anatomy, the behaviour of skin, fat and muscle under every condition," says DNEG creature supervisor Adam Vanner, who oversaw the work on *Deadpool* 2. "They also need a creative eye to push the performance laid out by the animation team to the needs of each shot."

Rigging becomes a key aspect of creatures, since it interacts with so many parts of the pipeline. "We need to make sure that there is excellent dialogue between rigging, animation and creature artists," states Vanner. "We need to make hundreds of judgement calls along the way so reviewing the work and progress is key. For example, one of the hardest areas to tackle is raising the arms high above the head. If we know we never see this, we can spend more time on detailing the poses which we will see."

Rigging and other creaturebuilding aspects are generally handled in Maya and Houdini, but like many studios, DNEG has its own proprietary rigging setups (their modular rigging system is called Pinocchio, while their hairgrooming tool is called Furball).

"We also have toolkits for solving and learning pose networks, building complex cloth and muscle setups, sculpting and simulation," adds Remi Cauzid, a DNEG creature supervisor on Ant-Man and the Wasp. "In the last few >











years we've started to use Ziva
Dynamics which is a muscle and
skin simulation system for Maya.
As it's commercially available it
has the advantage that crew new to
DNEG don't need to learn a whole
new system if they have already
used it at a different studio."

GOING BIG, AND GOING SMALL

For Ant-Man and the Wasp, DNEG not only had the challenge of crafting several digital double models - each with cloth, hair and muscle sims – it also regularly had to make them grow both larger and smaller than human size. Simulations began in Maya using nCloth and nHair, with an in-house muscle system running on Maya nodes. "We went for simplicity as the challenge was in 'scale differences' - assets had to grow and shrink," explains Cauzid. "So we went for a well-known tool we had the confidence in, that was versatile enough to give us a wide range of looks."

"We knew Ant-Man and the Wasp would scale from 0.01% of their sizes to about ten times bigger than a regular human," continues

Cauzid. "Gavin Thomas, our senior rigger on the show, did an amazing job providing downstream artists in creature FX (CFX) with stable data to run simulations. Then Dameon Oboyle, our CFX lead, and his team were able, in a first pass, to keep a consistent look for the simulations. No matter what the size, there had to be consistency to the fabrics. Then depending on the shot requirement, they were able to go for a 'macro' or 'mega' size look."

The character Ghost was one in the film that did not need to be scaled, but instead had a unique phasing effect. Her costume worn on set was also regularly augmented or completely replaced in CG. "When you see her, she is a mix between plate and CG side to side to create her 'ghost image'," says Cauzid. "This was done thanks to a lot of collaboration between the body track, animation

and composition departments.

Body track was providing us with accurate versions of the real Ghost, so we could digitally enhance her. Animation was creating Ghost alternate performances and compositing was mixing all of the work to get the desired effect. While all of this was happening, the lighting, look-dev and simulation departments had no room for mistakes. The CG version had to look great: renders and simulations of the fabrics needed to match the reality perfectly."

The creature team's characters are right there on the screen, but of course it takes weeks and sometimes months to produce them. Getting to the end involves a lot of trial and error. The team has several ways of reviewing work and putting creatures through their paces to ensure the final shots will look correct.

Top left: Ant-Man in small-scale form. Dialling in smaller values for simulations proved a challenge for the DNEG creature team

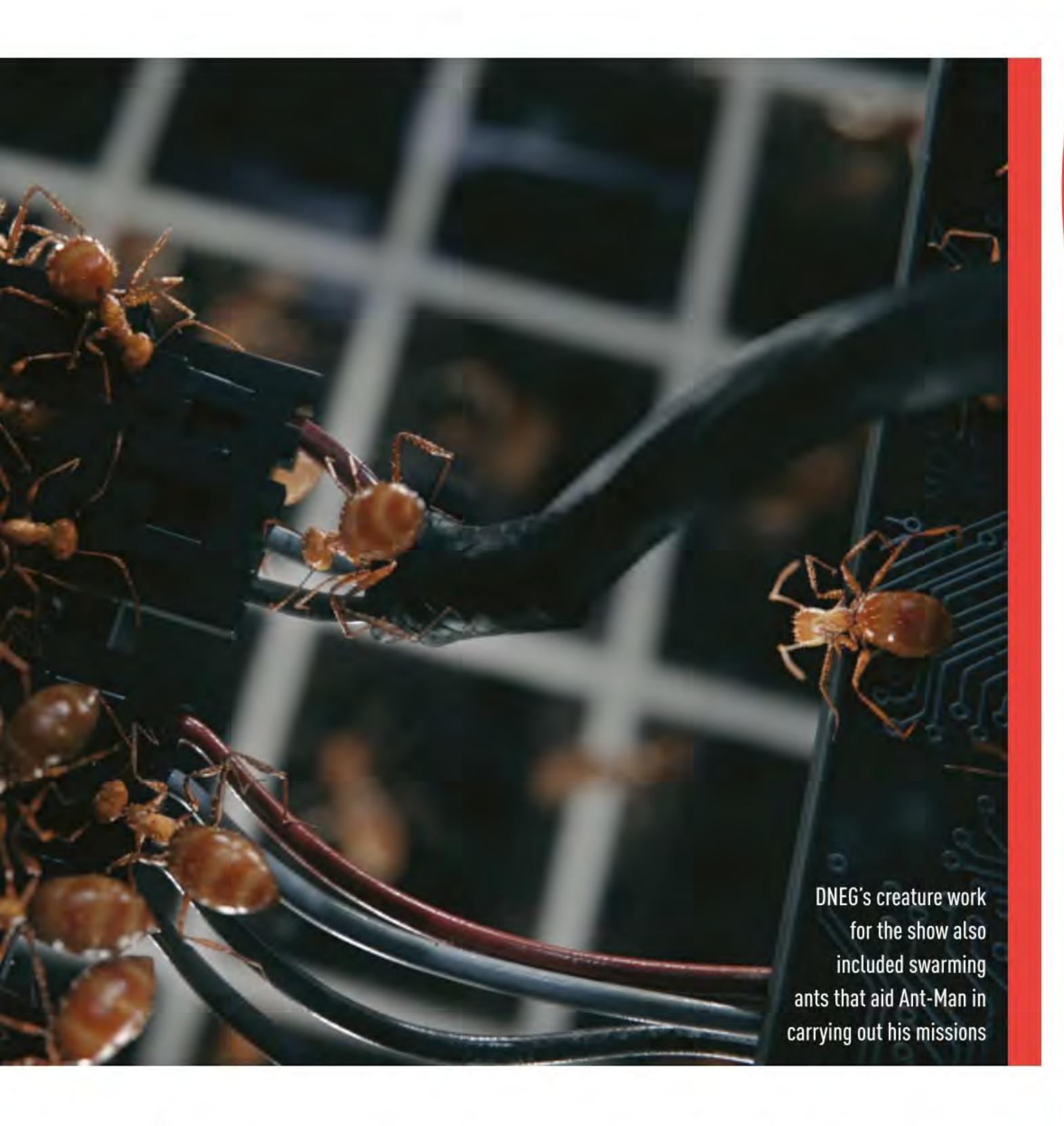
Above left: The San Francisco car chase in Ant-Man and the Wasp sees Ant-Man grow in size. This is the original plate

Above middle: The large Ant-Man required subtle cloth simulations for his suit that needed to still look realistic at this bigger scale



"NO MATTER WHAT THE SIZE, THERE HAD TO BE CONSISTENCY TO THE FABRICS"

Remi Cauzid, creature supervisor, DNEG



"At the beginning of *Ant-Man* and the Wasp," says Cauzid, "we used generic lighting – it gave us a good variety of situations on standard turntables. We also tested motion and cloth simulations using a standard 'dance' to go through extreme positions (stretch, twist and bend)."

"Once the assets were approved," the creature supervisor adds, "we had a setup to test for stability and compatibility. While we had to go closer and closer to the CG version of Ant-Man and the Wasp in the shots, the assets were rendered again and again in the same setup. This allowed us to make sure the look matched the previous version using the new 'upres' maps or models."

THE DEETS ON DEADPOOL 2

A diverse array of creature challenges met DNEG on *Deadpool* 2. One of the main tasks was to produce digital doubles and costume cloth simulations for Wade Wilson as Deadpool himself and his X-Force team members that matched exactly to the live-action performers. These came into play,

in particular, for a parachute jump scene that ends horribly for many of the X-Force team.

"At DNEG we always try to make sure our setups for hero characters and props can be seen very close up, because even if this is not initially required the needs of a shot can change during production," says Vanner. "For costume, especially Deadpool's suit and the parachutes, the biggest challenge is to get fine wrinkles. With this in mind, we simulate all but the microscopic wrinkles that never change.

"We rig a layered approach in nCloth via our proprietary tool Cloth Rig Builder, so we start with a low-resolution simulation. Because it's low resolution, we can turn everything up to the max, high collision and substeps, so it's very stable. We then add on one or two layers with extra mesh subdivisions. We normally constrain or input attract the highresolution layer, often called the 'wrinkle layer', to the base layer. As the collisions are already solved in the base layer we can often disable collisions. One key trick is that we

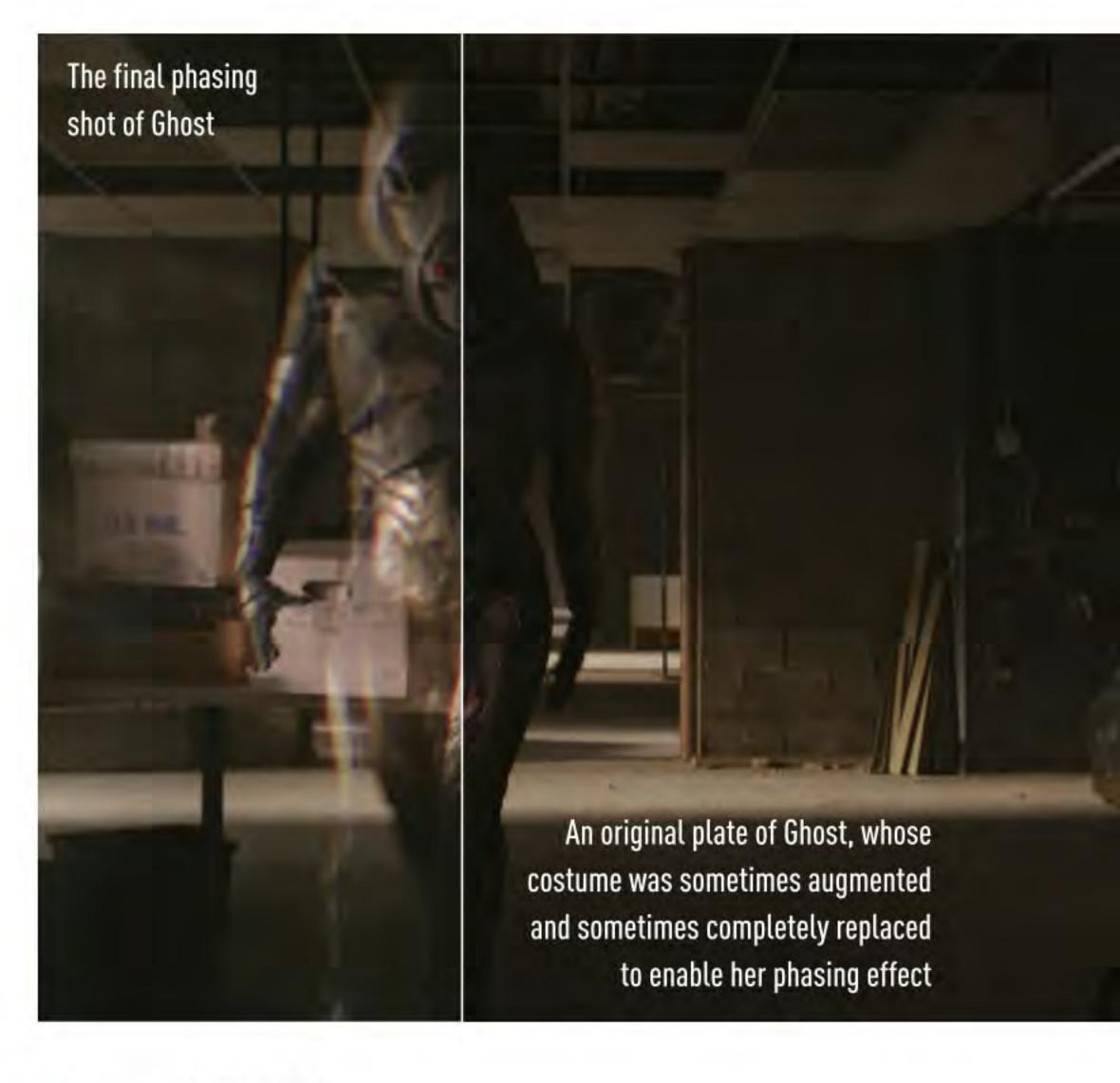


HOW TO MAKE A GIANT PIGEON

WHEN ANT-MAN AND HIS FRIENDS SHRINK DOWN TO A TINY SIZE DURING A CAR CHASE, THEY ENCOUNTER WHAT APPEARS TO BE SOME MASSIVE PIGEONS

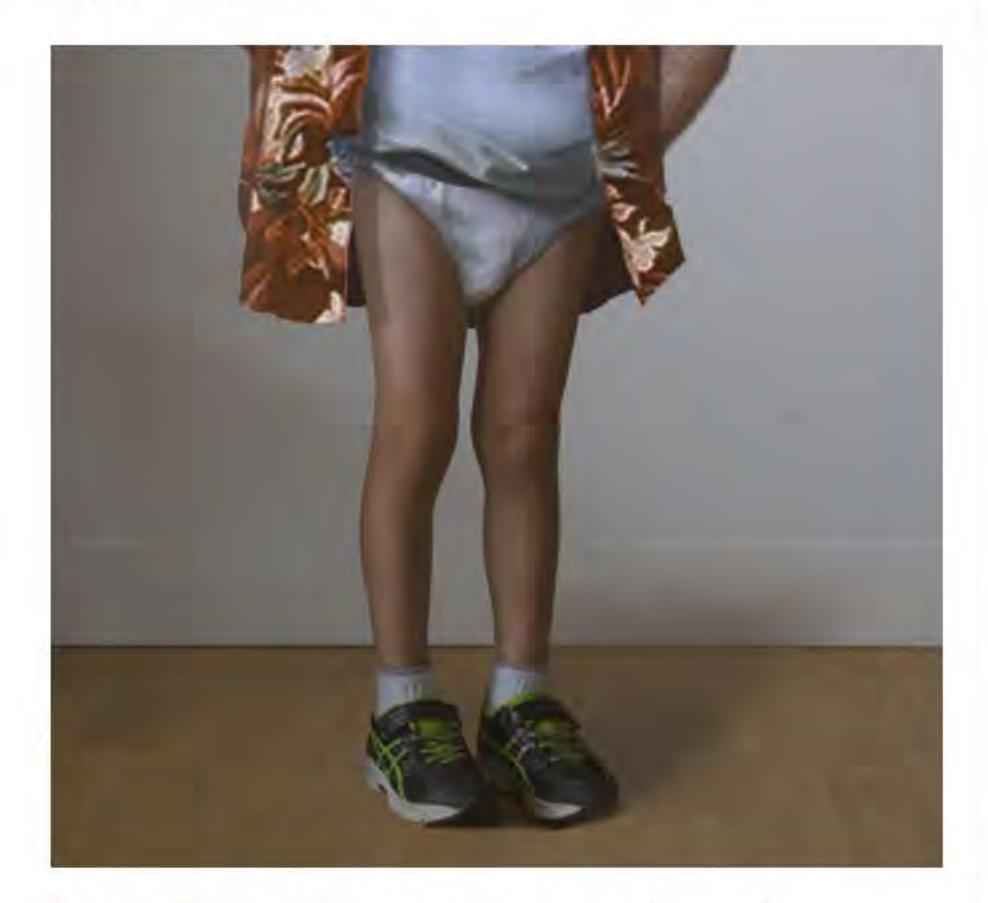
"The giant pigeons shot was a tough one!" says DNEG creature supervisor Remi Cauzid. "We are not used to seeing pigeons that close up so we had to make sure we used good references! Our build lead, Daniel Axelsson, went out chasing pigeons with his camera. This is basically what you have to do – look for references as much as you can, and do not make things up.

"The 'actions' for this pigeon were limited, so we focused on the limited range of motion it has to perform, but made sure this was looking as good as possible. And communication was a key thing – assets with feathers, animation and complex shaders always involve more artists than usual."



BABY LEGS: AN EVOLUTION

DNEG'S CREATURE TEAM CAN FACE MANY CHALLENGES. FOR DEADPOOL 2, ONE OF THE WEIRDEST WAS MAKING WADE WILSON'S BABY LEGS



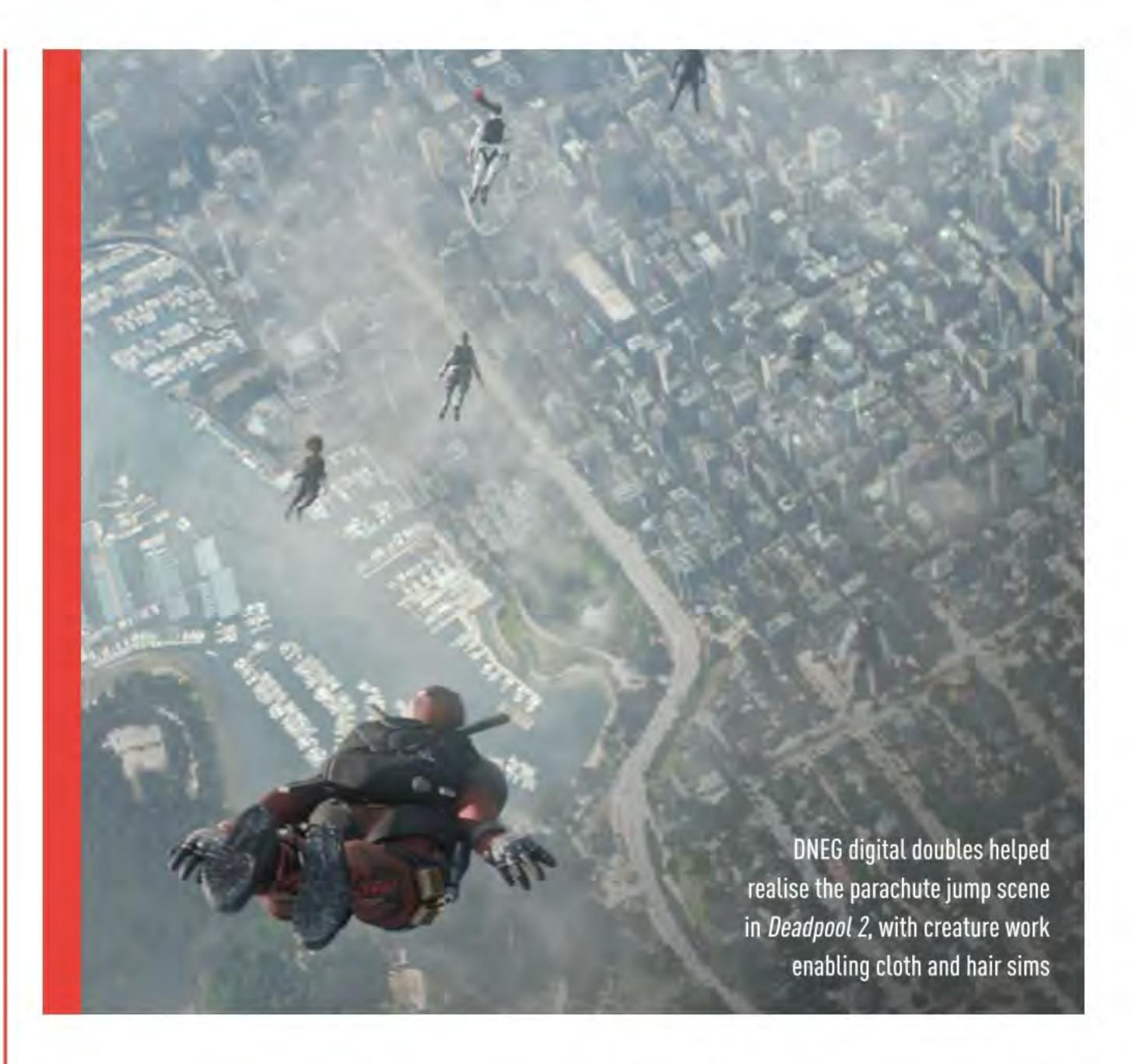
Concept: DNEG's art department helped contribute concepts for how Ryan Reynolds as Wade Wilson would appear with baby legs, which are growing back after they have been ripped off by Juggernaut.



Live action: Reynolds was filmed wearing a tracking suit. "Ryan Reynolds was very involved throughout the production," says DNEG creature supervisor Adam Vanner, "and gave us regular feedback on ideas. He even sent us videos of him delivering lines from his phone when we asked for more reference material."



CG legs: "The approach was animation driven, and we put lots of corrective blendshapes within the rig to add tendons and muscle groups to allow animation to see essentially the final result," explains Vanner. "We did a final pass for self contact using nCloth and some small refinements. We also simulated his hoodie and shirt so that it fitted his small profile."



turn the compression resistance down in the base layer and then high in the wrinkle layer. This forces compressing cloth to turn into wrinkles. The result is cloth you can get very, very close to, yet is fast to simulate."

For hair simulations in Deadpool 2, DNEG used a heavily modified nHair setup that allows artists to see the simulation driving the studio's Furball hair system within the rig. "Setting the rigs up is very automated," notes Vanner, "so we actually simulated the Peter character's moustache when he was skydiving, just because we could – it was one checkbox, so why not!"

Sometimes DNEG's creature work is not for whole digital assets, but just portions of them. Such was the case for the character Cable's arm in Deadpool 2. The arm consists of numerous overlapping cables that directly segue into real skin. Says Vanner: "Our rigging lead, Steven Bills, did a great job of managing the complexities of the setup. A lot went into planning where each cable would be attached and where it would slide when under compression. We had imagined it would be a very taxing task with a lot of corrections needed in shot, but he did such a good job that the rig pretty much

always worked from animation with minimal tweaking needed by creature or shot-sculpt artists."

Indeed, the importance of collaboration between the creature team and others at DNEG cannot be understated, according to Vanner. For example, he says, "the rigging team is right next door to animation to help this key partnership work as best as can be. It's essentially a service industry and rigs need to work for animators, so riggers and animators get to know each other and socialise a lot together."

The creature team also collaborates significantly in terms of animation and CFX. "As a creature supervisor," states Vanner, "I often sit in on animation dailies – this is where Eric Bates, the animation supervisor on *Deadpool* 2, reviews his team's work. It helps smooth the path for change as I can highlight issues before they get to CFX."

"In return," says Vanner, "Eric sat in on creature dailies and would see and shape the progress of the work we were doing on his team's work – his input was invaluable.

Catching problems early by keeping communication flowing, and keep socialising, are probably the most important pieces of advice I can give to anyone working in a team."

WHEN YOUR CREATURE IS... A PARACHUTE

Fred Chapman, Head of Creature (Vancouver) at DNEG, details the creation of the parachute cloth for a key jump sequence from Deadpool 2

Layer 1: Animation For this scene we built parachute animation rigs that gave the animators control to pose the general shape and position of the parachute and its attachment to the X-Force member. The model and rig needed to be created so that the ropes stayed straight, as they were always under tension.

The model for this rig and animation layer should be quite coarse as it is just used for the primary placement and shape, not for any details of the cloth. It also doesn't matter if the cloth deforms a little in animation as the later sim layers will correct for this. When the animation is ready it can be written out as an alembic cache to keep future layers clean and fast. It also allows us to update the animation input into the cloth layers by reading in different caches.

Layer 2: Base cloth sim It's time to add our base layer of nCloth sim. This layer will be on the same low-resolution mesh, and will form the coarse movement of the cloth, affected by gravity, drag, wind, turbulence and any collisions. Constraints were added to the ends of the base parachute so that it would follow the anim cache. Other constraints were added to this layer to attach the ropes, and to help preserve the volume of the parachute when needed.

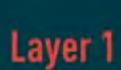
During each shot, the constraint values can be animated to give greater or lesser amounts of attract to the animation depending on whether those areas should look under tension and more rigid, or looser allowing more reaction to wind and other forces. If collisions or self-collisions are needed they can be added to this layer as the low resolution means they can be calculated much quicker than on the later higher-resolution layers.

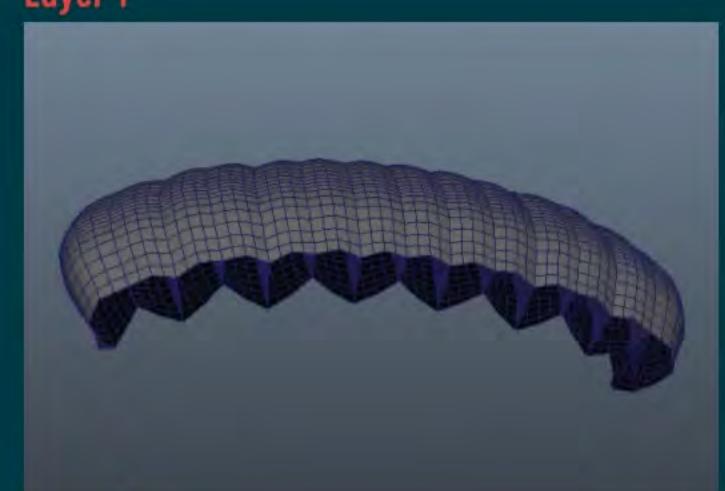
Layer 3: Ripples Now that we have the broader movement of the cloth added on top of the animation, the next layer to add is the ripples. Because the ripple layer doesn't need to react to the movement of the parachute in the scene, we don't need it to be sim'd in situ. We'll create a duplicate of the model at the origin and use a wind force to create the smaller ripples. Once we're happy with the look of the ripples, a blendshape can be used to add the ripple motion on top of the base cloth sim on the parachute.

One thing to also remember during this process is that simulations such as cloth can be time-consuming to process - those many iterations add up to a lot of time, often time that we don't have available. So it's important to us that as well as looking good, our processes should be fast, and give us lots of control over the output.

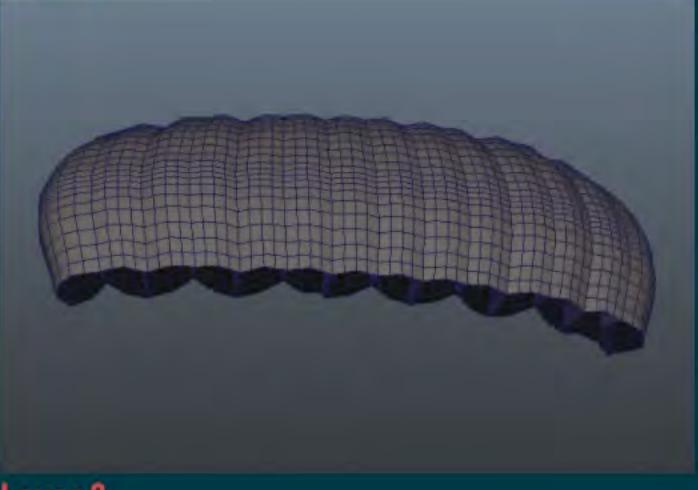
Layer 4: Wrinkles We have a mesh with both coarse and medium-level cloth detail that follows the animation, so our final layer is the very fine wrinkle layer. This layer adds dynamic cloth wrinkles to maintain surface area where the cloth surface compresses. As the detail is much finer than the previous layers, we need to subdivide the parachute mesh by smoothing 1-2 levels on both the output of the ripple layer and our wrinkle nCloth mesh.

We use an input attract between the ripple mesh and the wrinkle mesh with a value of around 90% so that the wrinkle mesh follows all the previous layers. We don't use any additional forces on the cloth but we do set the stretch and compression resistance of the cloth to be much higher than in the base sim. This forces the cloth to stick to the ripple layer wherever possible, but still form natural-looking wrinkles as the cloth moves around.

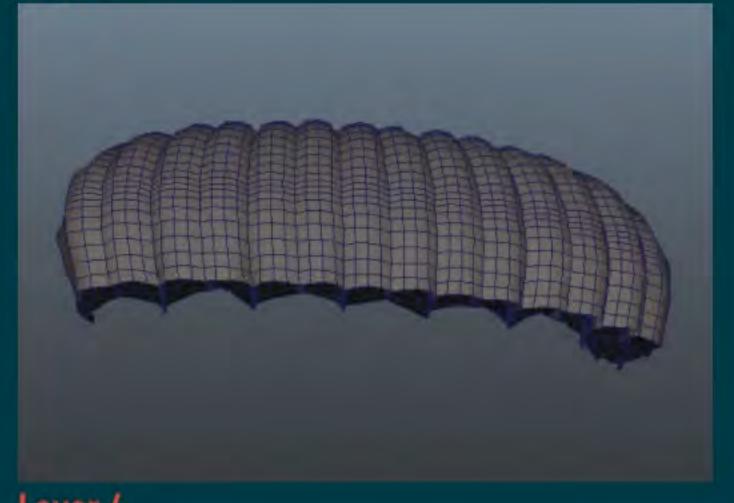




Layer 2



Layer 3



Layer 4





KEYSHOT 7 & 8

MASTER YOUR KEYSHOT RENDERS

Discover how to improve your render experience with our 30 expert tips

endering an image, animation of a model or even a whole scene is an important step in art creation, and by not taking your work through this process the end result will look unfinished. Even if you are aiming for a rustic style, it looks better when it is actually rendered that way. Whether it is just for a portfolio or commercial purposes, being able to render your work is a valuable expertise.

Every artist has a favourite render engine to work with. KeyShot offers a wide range of tools and simple rendering solutions, enabling the user to have a beautiful and seamless creative experience. The easier the workflow, the better and quicker the results. Knowing your way around the software allows

you to concentrate on the creative side of the process.

It might initially seem a little difficult to get to grips with for beginners, no matter how straightforward the software may be. At the beginning of my 3D career I kept wondering: Am I doing it wrong? What if it does not look good to others? How do I make things look interesting or attractive to the eye? It is only fair to admit that even with a few years of experience under my belt, I still ask myself those questions. It can take a long time to realise that you are being too harsh on yourself and your work.

To reduce that self doubt and the stress that comes with it, the best thing to do is to familiarise yourself with the software. Be patient. Get used to it. Learn what it can do to help you through the journey, and finally, experiment! It is very easy to get frustrated if you do not give yourself the time to explore the options, and instead try to learn on the job.

It may seem like there is a lot to learn about for this particular software, but that is not the case at all. Here I have provided some tips to help guide you through it; be aware that some of these steps are exclusive and based on the newest version of the software, KeyShot 8 Pro, and are not available in KeyShot 7 or older.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to www.bit.ly/vault-242-keyshot



AUTHOR

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started her career in
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Abe's Oddysee –
New 'n' Tasty.
artstation.com/
mayajermy



Master your KeyShot renders

This is an online library of materials, environments, textures and backplates – there is a great variety of resources to choose from. You can also upload your own materials to share with other KeyShot users. Great community effort. Maya Jermy

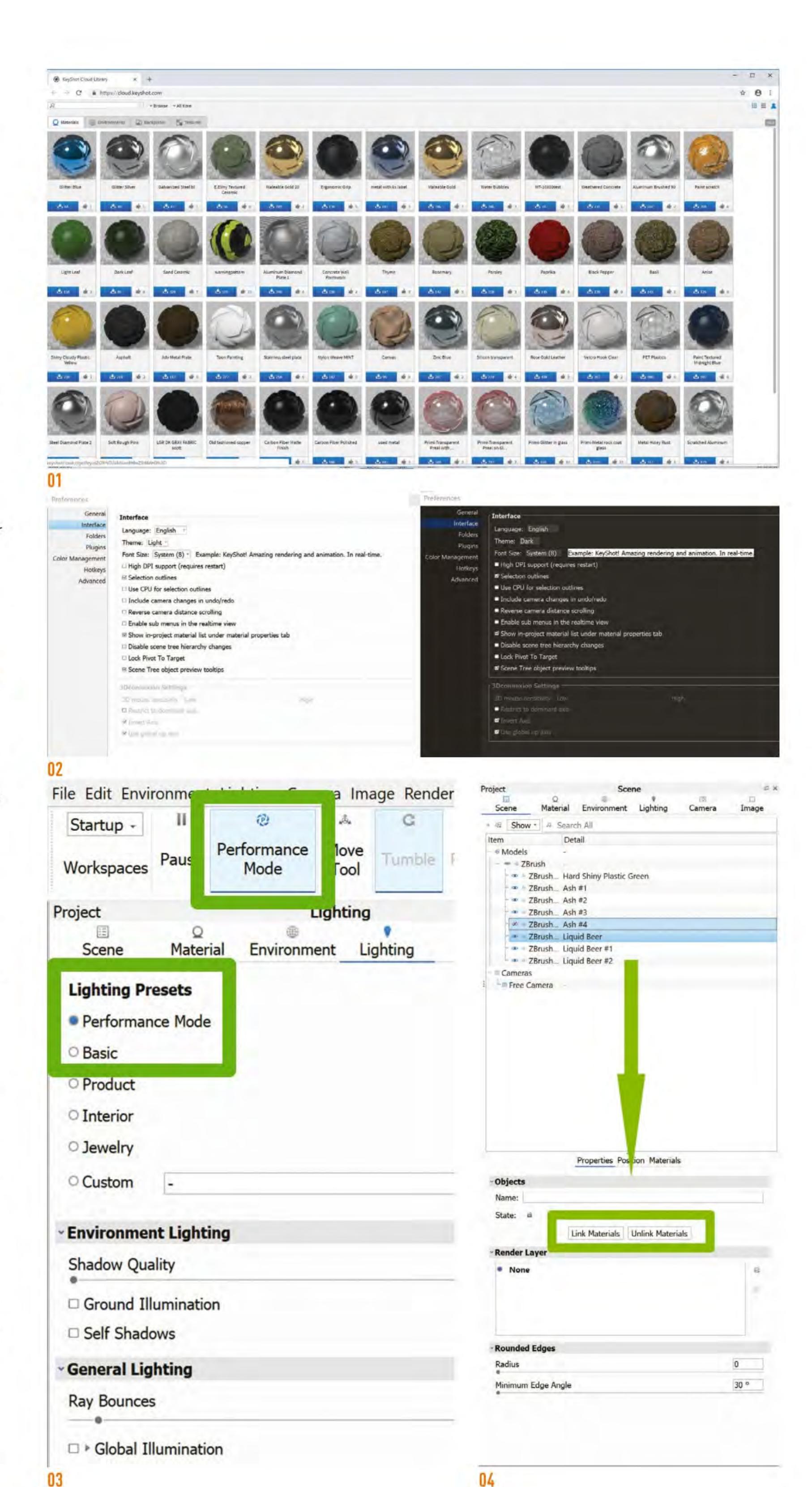
CHOOSE A UI THEME A quick process that can greatly assist with your learning is setting up your own interface layout. Putting relevant menus and tabs in strategic places can speed up your workflow and learning process. When you know where to find the things you need, you will feel more familiar with the software. KeyShot offers two colour themes: light and dark. To change the theme at any time go to Edit> Preferences>Interface, or select it from the Workspaces Startup ribbon dropdown. Maya Jermy

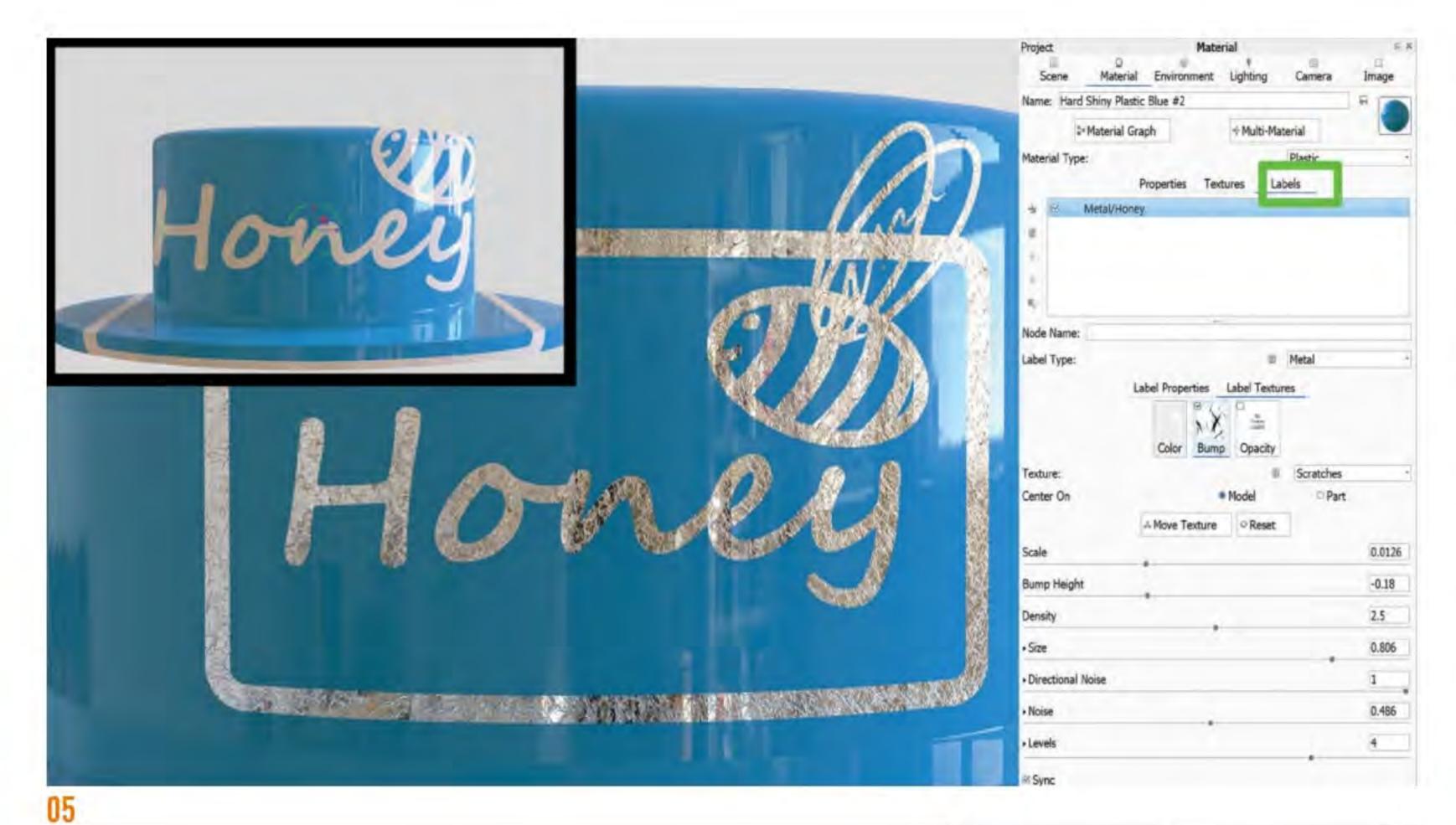
Once you've added a lot of lights to your project and the scene becomes 'heavy', navigation performance will drop. Moving around the scene becomes difficult and laggy. The best solution is to activate Performance Mode. It will remove certain light settings (global illumination, ground shadows) from the active render and reduce the CPU usage pressure. You can also find it in Project>Lighting>Lighting Presets. Maya Jermy

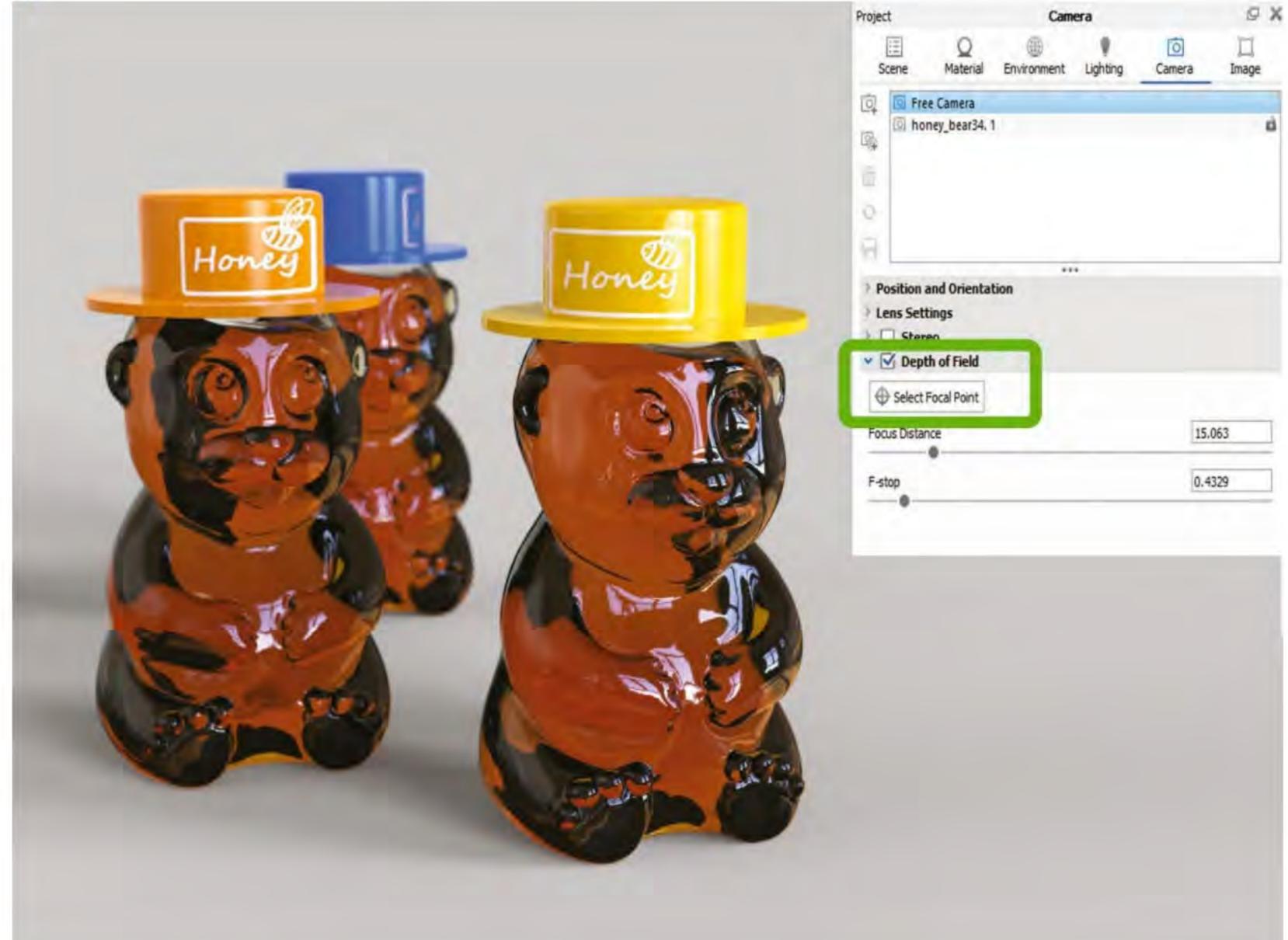
If you have a material you want to apply to multiple objects, there are a few things that can be done. First, you can save out the material to your library, then apply it to the selection of objects. Option two is to material link the objects so all receive the updated changes. To do this, select two or more items and press Link Materials. Alternatively, right-click on the selected objects and from the pop-up menu select Material> Link Materials. Maya Jermy

05 APPLY MATERIALS

Labels do not need to be plastic and boring. Once applied to a







Output Still Image Animation KeyShotXR Configurator Options honey_bear34.15.png C:/Users/Maya/Desktop ▼ ☐ Include Alpha (Transparency) ☐ Metadata ☐ H: 2638 px Resolution W: 3840 px Presets * cm * at 300 DPI 🛨 Print Size W: 32.512 H: 22.335 Layers and Passes Render Layers 🔆 ☐ All Render Passes Reflection Clown C ☐ Diffuse ☐ Depth Lighting Refraction Normals Global Illumination Shadow Labels Ambient Occlusion Caustics ▼ Region 1918 Left: 2016 Width: 436 Height: 502 Render



model, labels can take on any material, bump or opacity desired. It is literally as simple as drag and drop. To add a little wear and tear to a label, just find the right texture map and drop it in the Bump slot of the Labels tab. Select a procedural map from the drop-down menu, for example, noise. If you want to apply the same texture as the parent object's, select the From Parent option. Alternatively, navigate to the parent Texture tab, select the Bump tile and tick Apply Bump To Labels located below. It will project the same map on all labels applied. Maya Jermy

Tired of adding depth of field in post-production, faking it in Photoshop? Try adding it to your active window and see the results before hitting the Render button. Depth of Field sits comfortably in the Camera tab, where it can be easily activated and manipulated with just a few sliders. You can also set the camera focus by clicking on the part of the model you want to drive attention to. KeyShot will apply the set amount of blur based on your chosen focus and distance. Maya Jermy

This is especially useful when working on a big project, in Performance mode – there's no need to render the entire thing just to see how a little piece will look rendered. Open the Render menu and choose the region you want to render. This will save you some serious time, and prevent your machine from overheating in the process. Maya Jermy

RENDER GLOSS PASS
KeyShot does decent render passes based on the materials and lights used in the scene, but sometimes it is not enough and it would be useful to have additional renders of just clean specular and gloss. The best solution is to change the environment to plain black, and apply glossy black material to the model. In the material editor adjust reflections and roughness (gloss), then use a pin light to capture the right look.

Maya Jermy

Master your KeyShot renders

Import your logo to a label and apply it to the model. Set the scale and position using the sliders. Hold Alt and drag and drop your diffuse material on the Bump slot to copy it. Scroll down to Label Texture>Bump and set it to, for example, -1. Maya Jermy

In this section you are able to create a new material, duplicate it, tweak it and link textures. It is useful when creating variations of material or colour, because it allows quick cycling through them all. You can locate it in the Project>Material tab. Maya Jermy

HDRI THREE-POINT LIGHT
Artists are usually very familiar
with the three-point light term. It
focuses on three sources of light,
which are generally enough to
beautifully light the scene. These
are: key light, fill light and rim light.
You can simply fake that effect with
pins in the HDRI editor. Maya Jermy

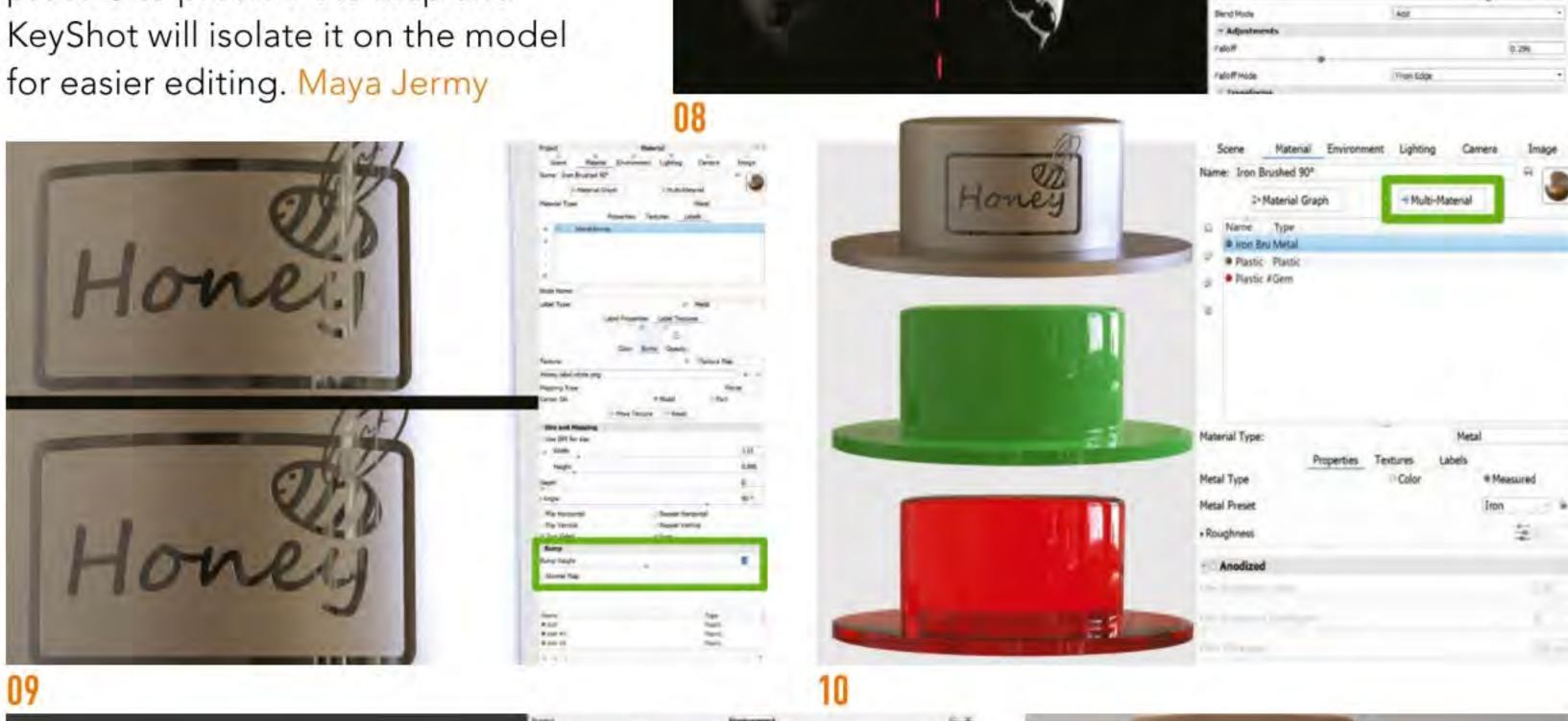
12 EDIT YOUR IMAGES
KeyShot is not just a render
engine – it also offers some basic
post-production editing tools.
While your image is rendering, click
the pencil icon in the active render
window. The Show Effects panel
enables you to tweak elements like
exposure and colour, or add effects
like bloom and vignette. When
only these basics are required,
there is no need to involve another
application. Maya Jermy

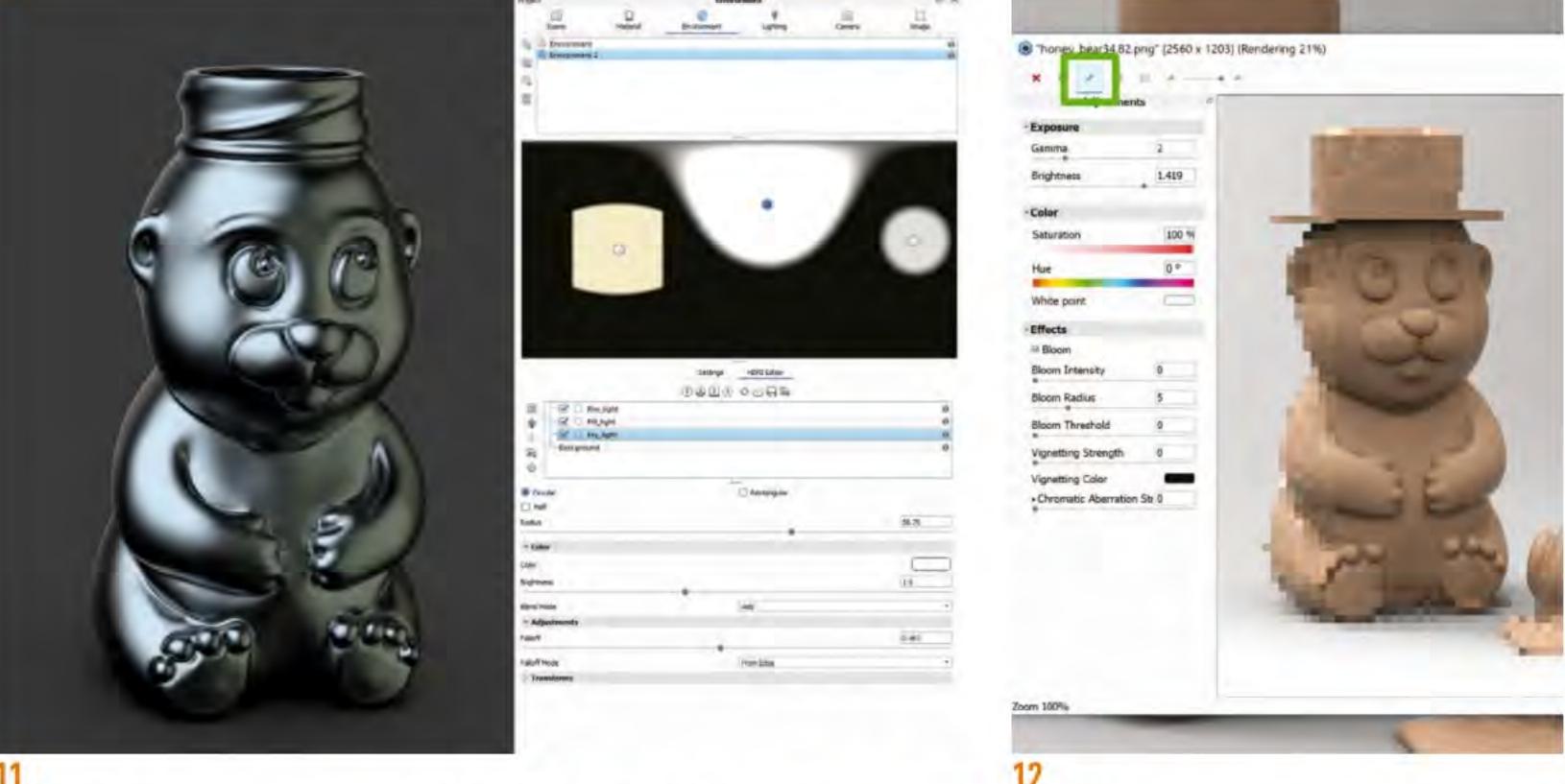
13 UTILISE IMAGE PINS
You can use image pins on
top of your HDRI environment to
successfully blend your model with
the scene. Load the image you
want to use as a light source and
position it by moving the pin in the
HDRI editor, or click on the model
to point the projection at the right
place. Maya Jermy

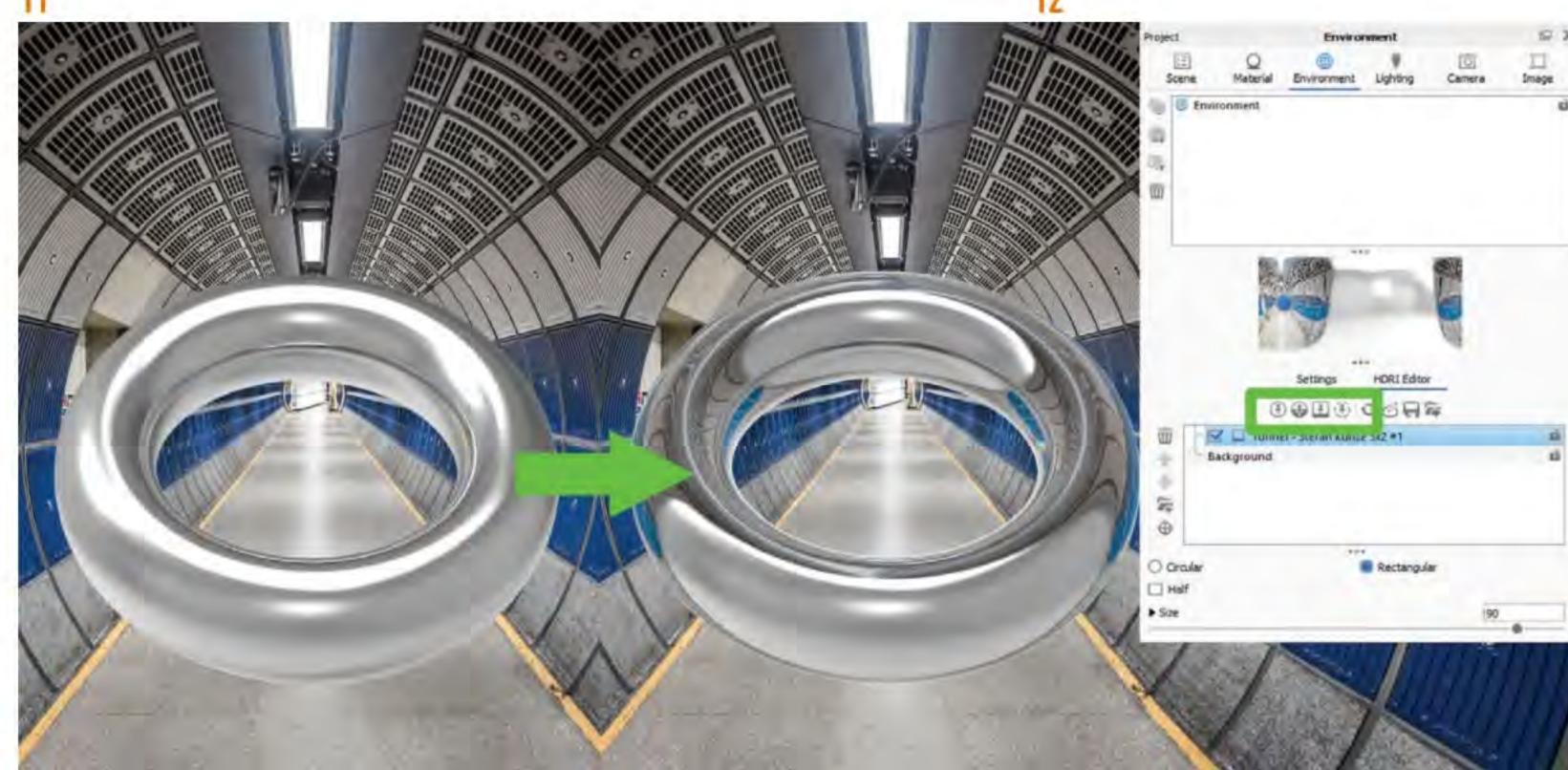
4 What if you've got that perfect HDRI but there is a nasty hotspot ruining the image? You can block it easily, just create a pin light, adjust the size and shape, change colour to grey (or any colour to blend with the HDRI),

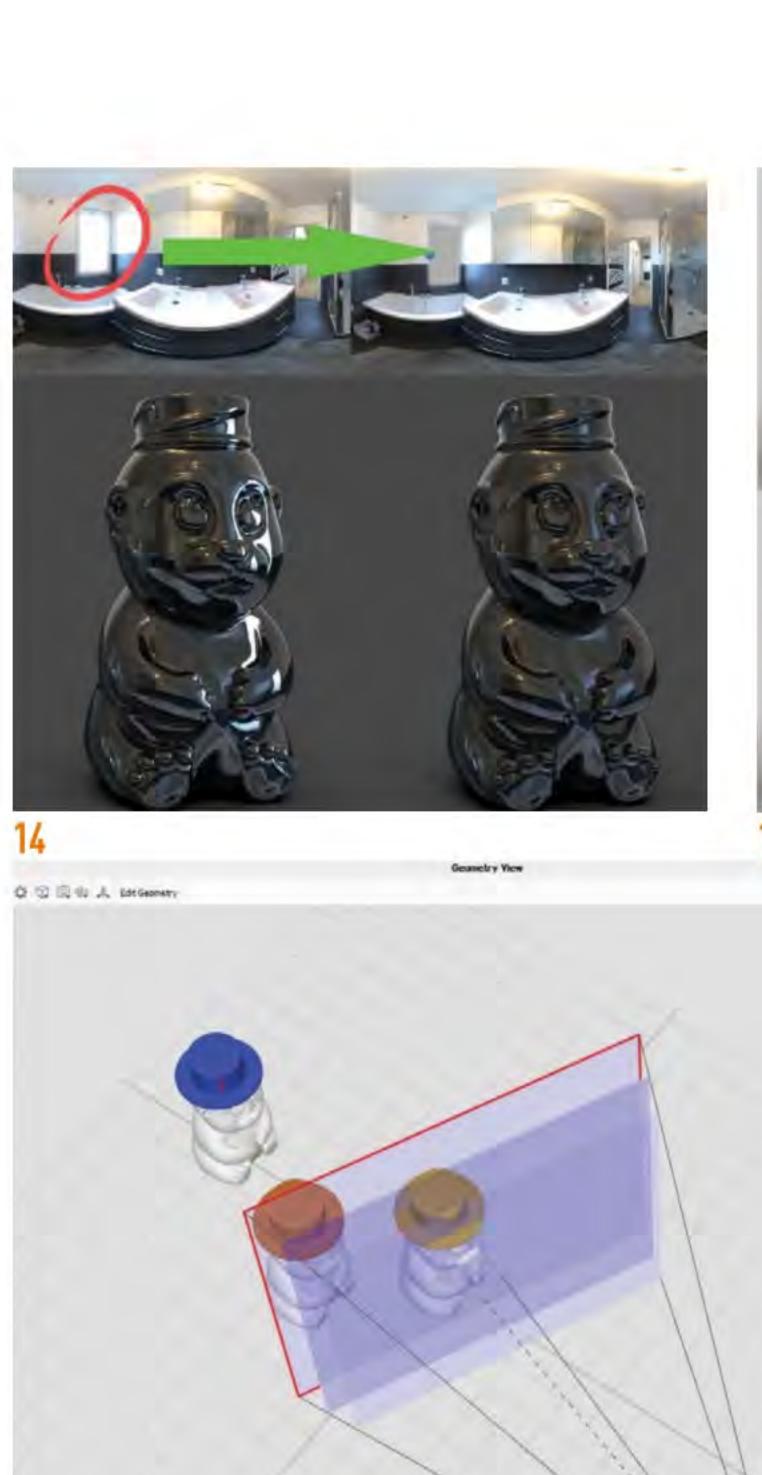
change type to alpha and place it on top of the hotspot. Maya Jermy

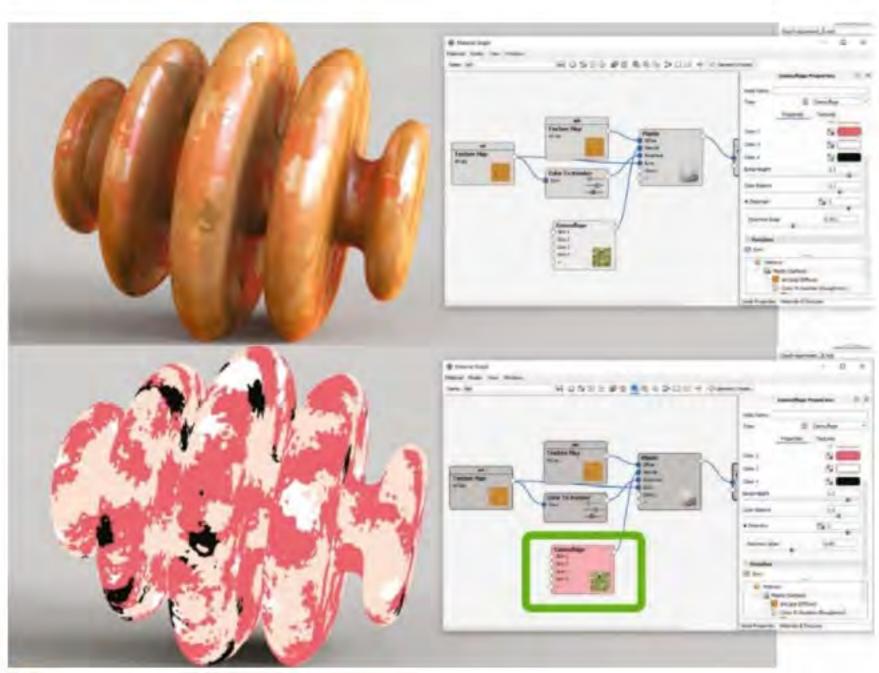
15 PREVIEW THE MAP
If you are working in the material editor applying layers of changes and adding lots of maps to the mix, you may end up struggling to see the difference it makes to the final look. A bigger problem may appear if you need to edit a single map and you cannot see much through all the layers. Simply click on the texture and press C to preview the map and KeyShot will isolate it on the model for easier editing. Maya Jermy



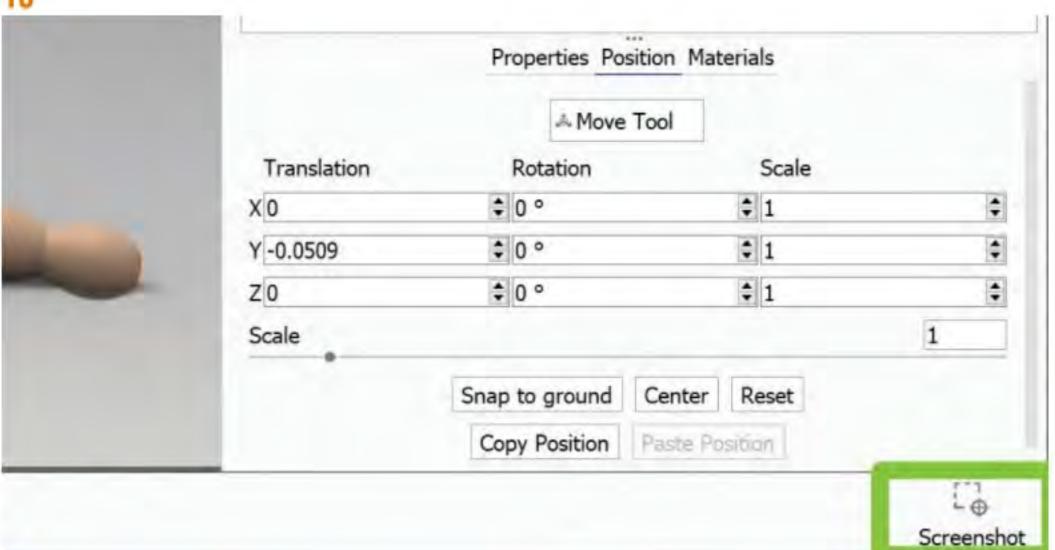




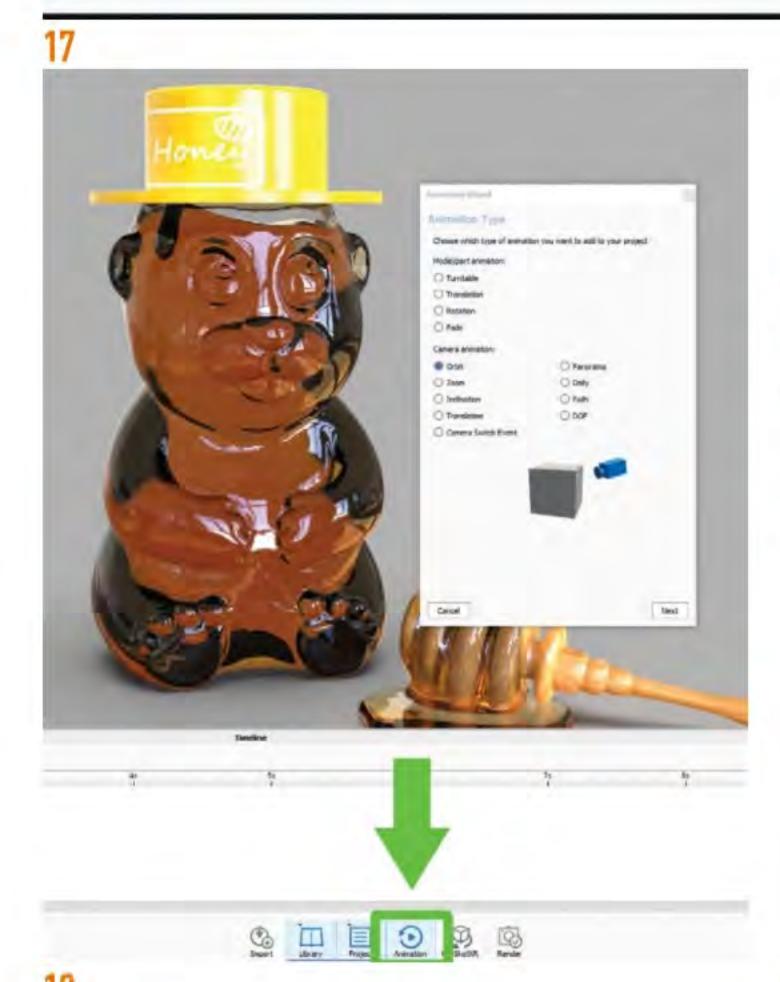














WORK IN GEOMETRY VIEW

Sometimes it is easier to work in the Geometry View when setting up the scene. Hit O on the keyboard, or navigate to Window> Geometry View and a secondary viewer will open. Navigating in that mode is a lot quicker. It allows a much smoother camera, physical lights and model positioning, scene composition as well as viewing all camera paths. Maya Jermy

7 TAKE SCREENSHOTS

The quickest way to screen grab your active window is to press P on the keyboard, or alternatively, press the Screenshot button located in the bottom-right corner. It will automatically save the JPEG or PNG in the Rendering folder. The file format can be changed in the Preferences>General> Screenshot tab. Maya Jermy

18 UNDERSTAND IOR
The Index of Refraction is
very important in the re-creation
of real materials. KeyShot materials
already have correct IOR, but if you
create your own and want to avoid
visible errors, find the accurate IOR
value online and adjust it in the

Project Material menu. Maya Jermy

19 CAMERA ANIMATION SETUP
Whether you want to animate
the camera to zoom (dolly), tilt
(pan), rotate (tumble) or orbit an
object, KeyShot has a very simple
step-by-step setup to help you
along the way. You can also lock
the camera's pivot to a model and
create a turntable. Maya Jermy

This is a very useful tool for creating instances of models. Right-click on the model in the scene hierarchy tree and choose Make Pattern from the list. Unlike duplicates, instances are speed and file size effective, but it does not mean they are material linked. Maya Jermy

PRESENTATION MODE
As the name suggests,
Presentation Mode (Shift+F)
is made to showcase your WIP
without the surrounding menus.
It is a more elegant way to view
your model in its current state. It

TUTORIALS

Master your KeyShot renders

allows you to view all Model Sets and Studios for easy comparison. Maya Jermy

22 LIQUID SIMPLICITY
Remember how you had to split your glass model into three parts to render a realistic glass of water? Not anymore! One of the many incredible new features in KeyShot 8 is that the software takes care of it for you. You just need to make sure that the liquid model intersects the glass to create a proper refraction effect. There cannot be any space left between the two parts, they must overlap.

Maya Jermy

23 CREATE BUBBLES
There is an easy way to add bubbles to your materials.
Navigate to your material, open the Material Graph, right-click to bring out the nodes list, and select Geometry>Bubbles. Double-click on the Bubbles node to open the editor on the right-hand side of the Material Graph menu. The options let you edit the size, volume and scattering of bubbles. Maya Jermy

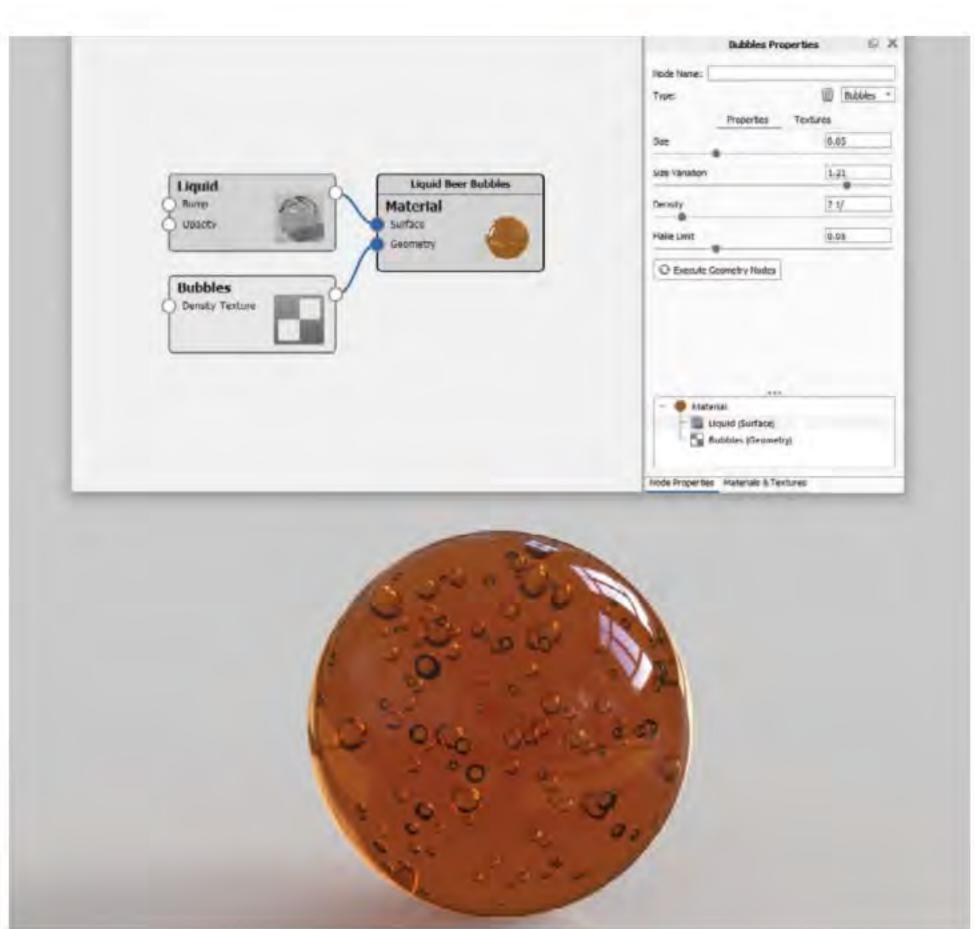
This new feature is a range of materials that will allow to showcase what is hiding inside a multi-part model. Add a dummy geo to the scene, for example, a cube, and apply one of the cutaway materials. Position the cube so it intersects the model. You can colour or exclude certain parts from being affected. Maya Jermy

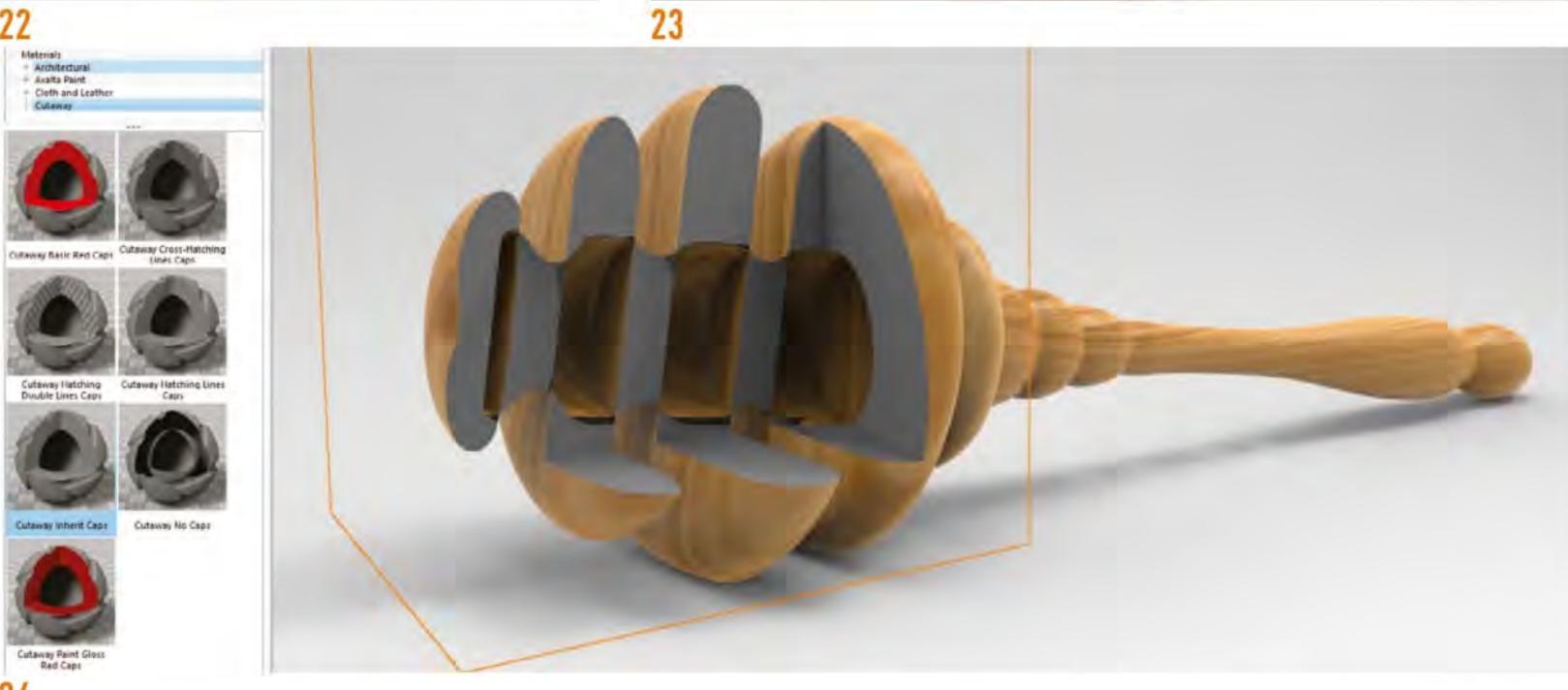
25 SCATTERING MEDIUM
Another fantastic set of new
materials that can be used in lots of
different ways. With just a few small
tweaks of the options available, you
can create all sorts of spongy looks,
fog, smoke, clouds and many more.
Maya Jermy

26 RENDER VOLUMETRICS
One of the newest (and coolest) features in KeyShot 8 is the ability to render volumetrics.
Consider it as a volume box with all possible effects applied to it – clouds, fog, sponge-like materials.
Look for free VDB files on the net to find new shapes of volumetric effects, from simple cigarette smoke effects, clouds, to heavy

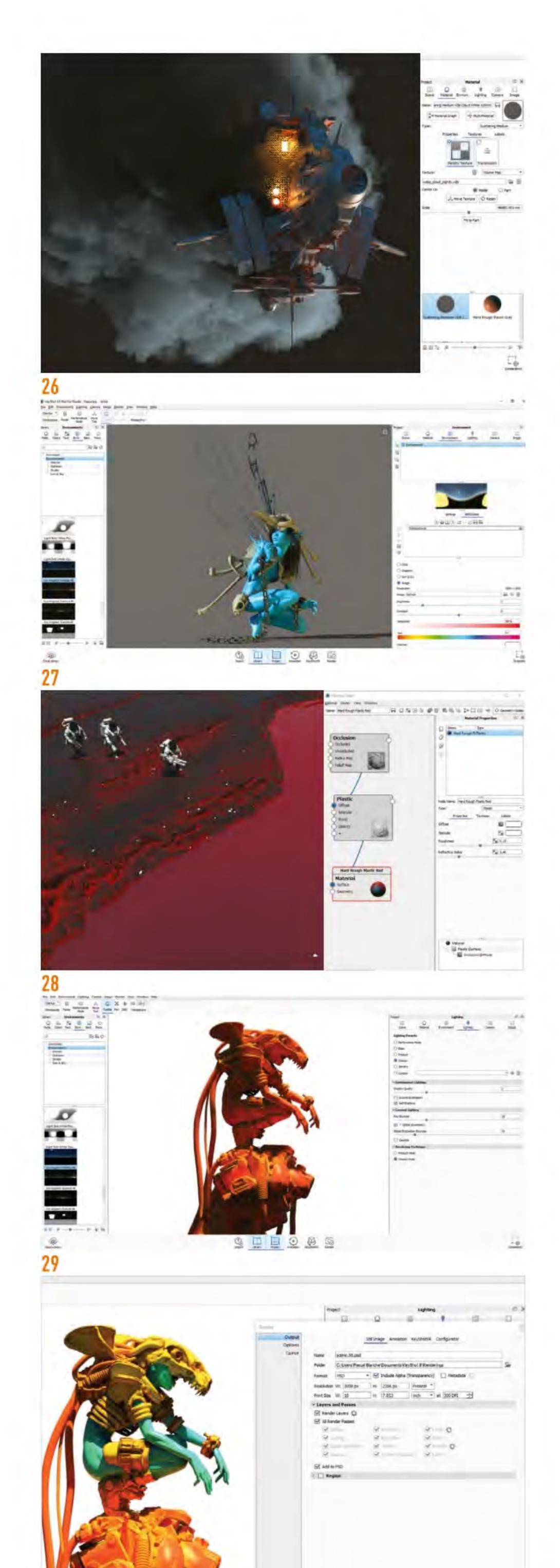












30a

Texture slot of your volumetric material and from there you can adjust its density and transparency. The final look will greatly differ as you tweak the settings, so you really have to experiment in order to get the result you like. The volumetrics will also be affected by shadows and lights too.

Pascal Blanché

27 SET UP HDRI MAPS
KeyShot comes with a large
set of HDRI images to help you
highlight your scene in no time. But

highlight your scene in no time. But what I like most is to set up my own HDRI map that will fit my needs.

I usually try to keep things simple. I create a main source light first, and then a rim light (a light that comes from the sides to create a light effect on the side edges of the subject). A good trick is to put the secondary light opposite the main light source: bottom if the main light is top, left if the main light is positioned on the right. Then I use the Settings parameters to fine-tune my orientation and intensity. KeyShot will always give you great lighting results. Pascal Blanché

20 MATERIALS

Another great asset in KeyShot is its preset material library, full of accurate shaders from classic plastics and metals to more complex offerings like car paints and skin shaders.

But if you open up the Material Graph editor, a whole new world opens up to you. Editing in nodal mode takes a bit of practice at first, but it gets easier very quickly.

My usual set of materials always relies heavily on the object's topography, where I set up rules to paint one specific material at one part of the object, like holes and crevices, and another type of material on bigger surfaces. I like to blend my material together by using the Occlusion or the Curvature texture as a mask, sometimes both for more complex results. Pascal Blanché

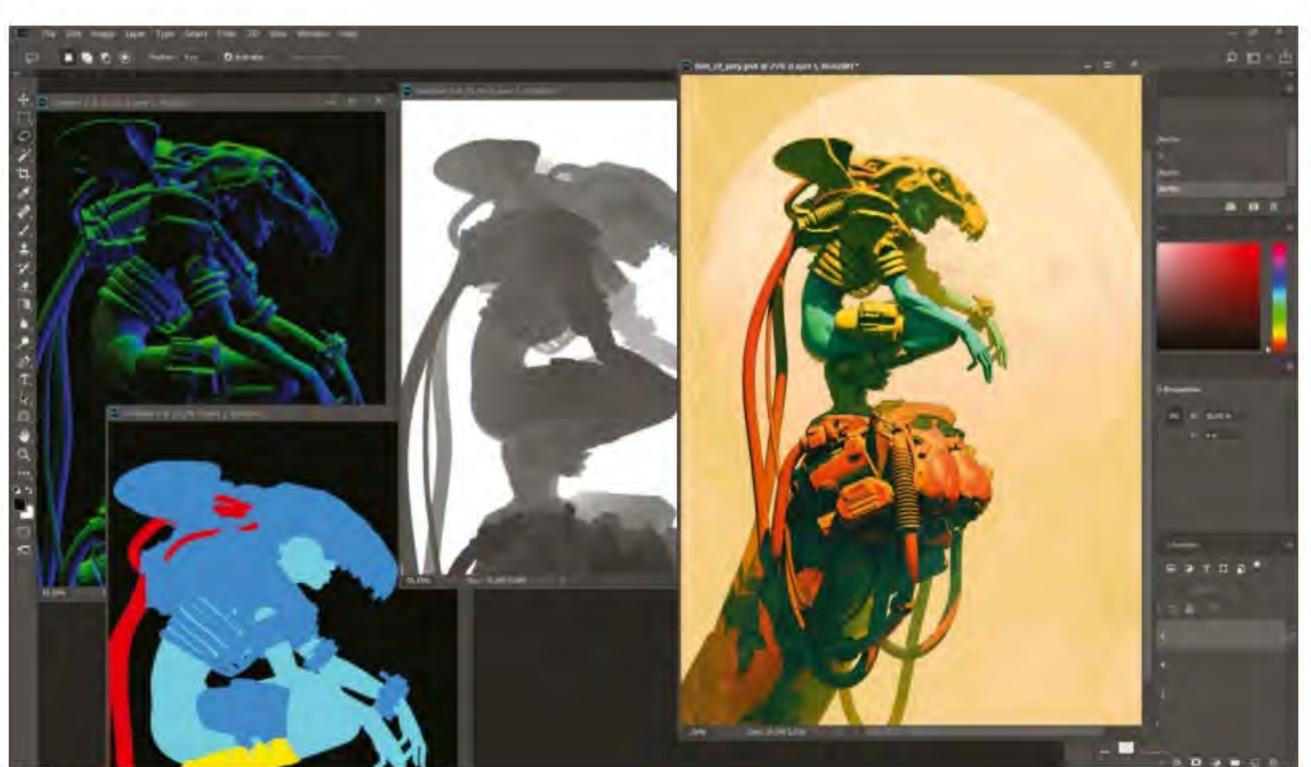
29 INTERIOR MODE FOR RENDERING

KeyShot is my favourite rendering tool. It is fast, accurate, it can handle heavy scenes and it can render in very large resolution in no time. It is a perfect companion for my personal illustration workflow.

Among the many rendering presets (you can find these in the Lighting section) I usually prefer the Interior Mode. This mode creates smooth shadows and seamless gradients, even at super high resolution, and I can get accurate and realistic renders. Note that the Interior Mode will require you to set up a rendering time limit, which will vary depending on the complexity of your scenes. Pascal Blanché

2 SET UP PASSES

feature in KeyShot 8 is the ability to select the passes you want to have embedded in your PSD files. You have a vast choice of options, like pro renders for the cinema industry, from depth pass to clown pass, specular, normal maps and more. I find all of these passes super handy for my post-processing work. Pascal Blanché.



30t



GRAVITY SKETCH | ANY 3D SOFTWARE

CREATE AN AKIRA-STYLE BIKE MODEL IN VR

Learn how to intuitively create a prototype model in virtual reality with Gravity Sketch



AUTHOR

Mike Griggs

Mike Griggs is a 3D and visual effects artist with vast experience across the industry, as both a creator and a technical writer.

www.creativebloke.com

he Holy Grail of digital creation is transferring analogue skill sets, such as drawing and sculpting, into a seamless digital experience. But what if you could combine the skills learned in 3D applications, such as the manipulation of vertices, edges and faces, in a virtual studio where models can be manipulated by pulling and grabbing with your hands?

The virtual reality creation application Gravity Sketch allows artists to do just that using a new paradigm for 3D modelling. It enables you to sketch in a 3D space and then augment with planes and polygons using a unique and intuitive toolset.

While still in its early days with version one, Gravity Sketch offers artists who are new to 3D a new and unique method of modelling, which allows artists of any skill

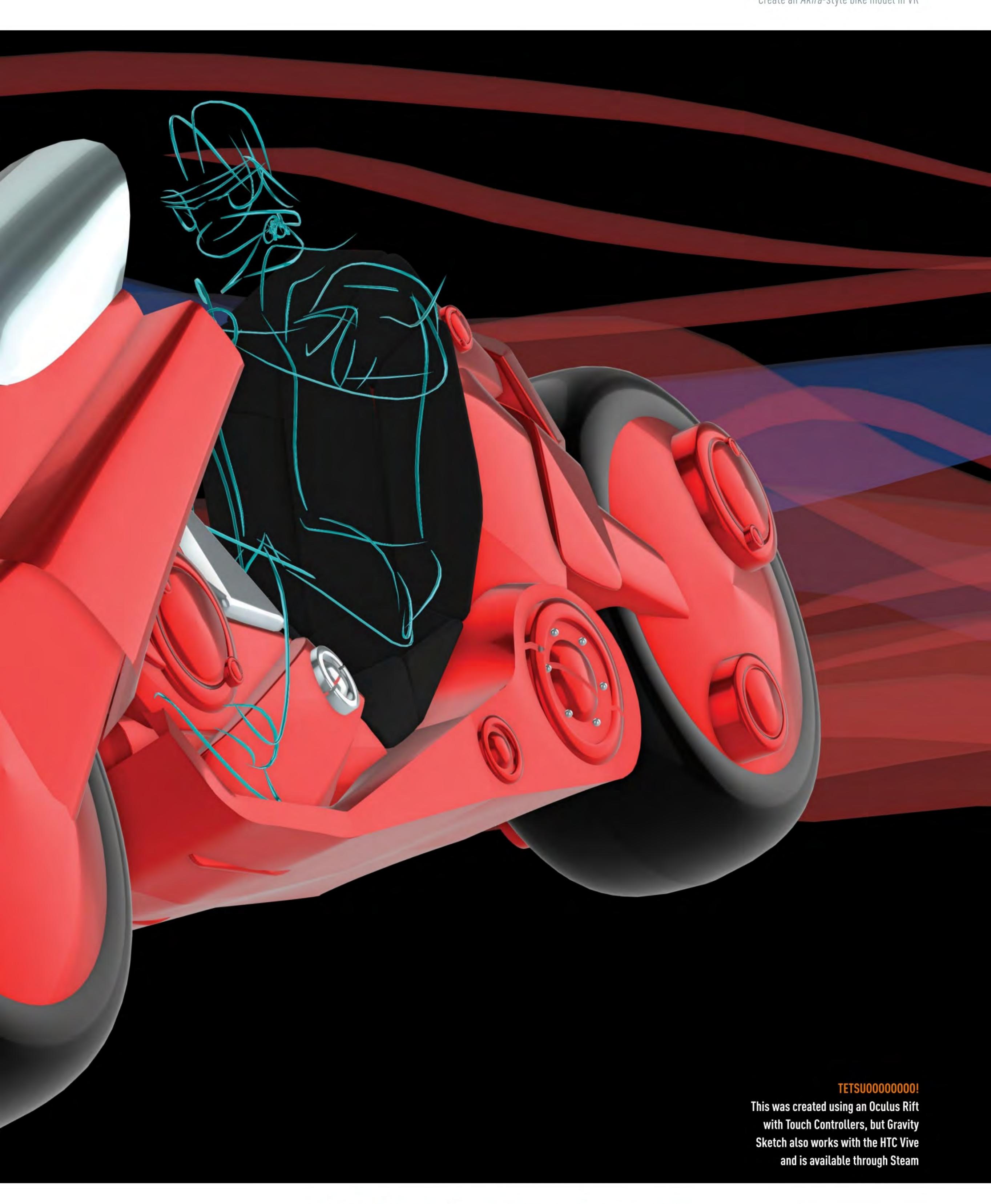
level to create complex shapes quickly and easily.

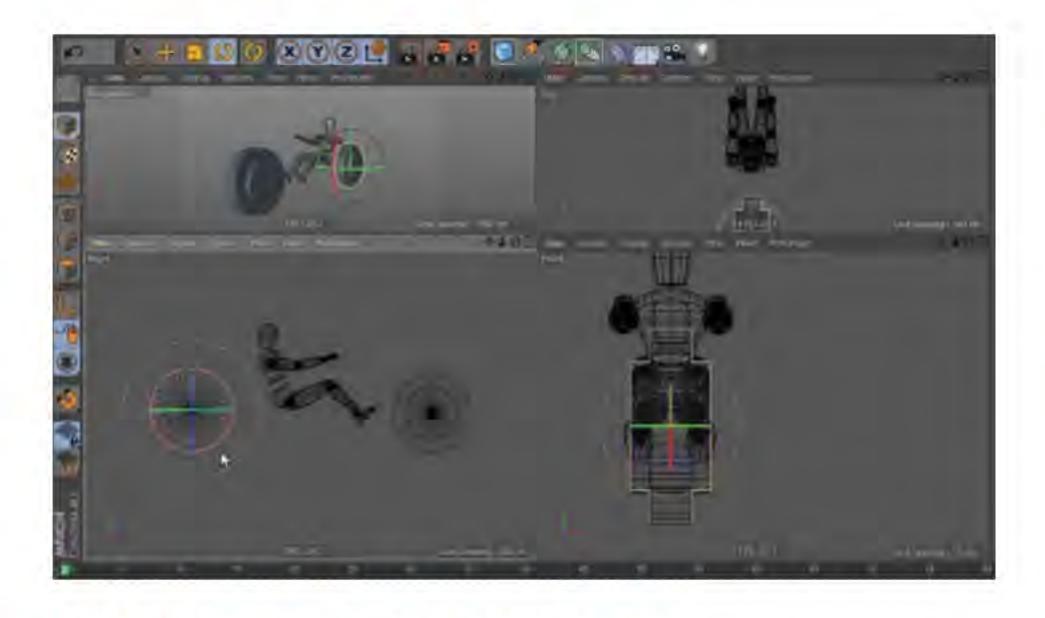
In this tutorial I will create a model based on the iconic motorbike from the classic anime Akira, as there have been many variations of its form since its inception as a 2D cel drawing. Therefore it is ideally suited for Gravity Sketch, allowing an environment where a new take on this iconic shape can be created. The tutorial will walk you through how to set up a scene and the tools needed to create a model like this, which will provide any artist with a footing in this amazing new creation software.



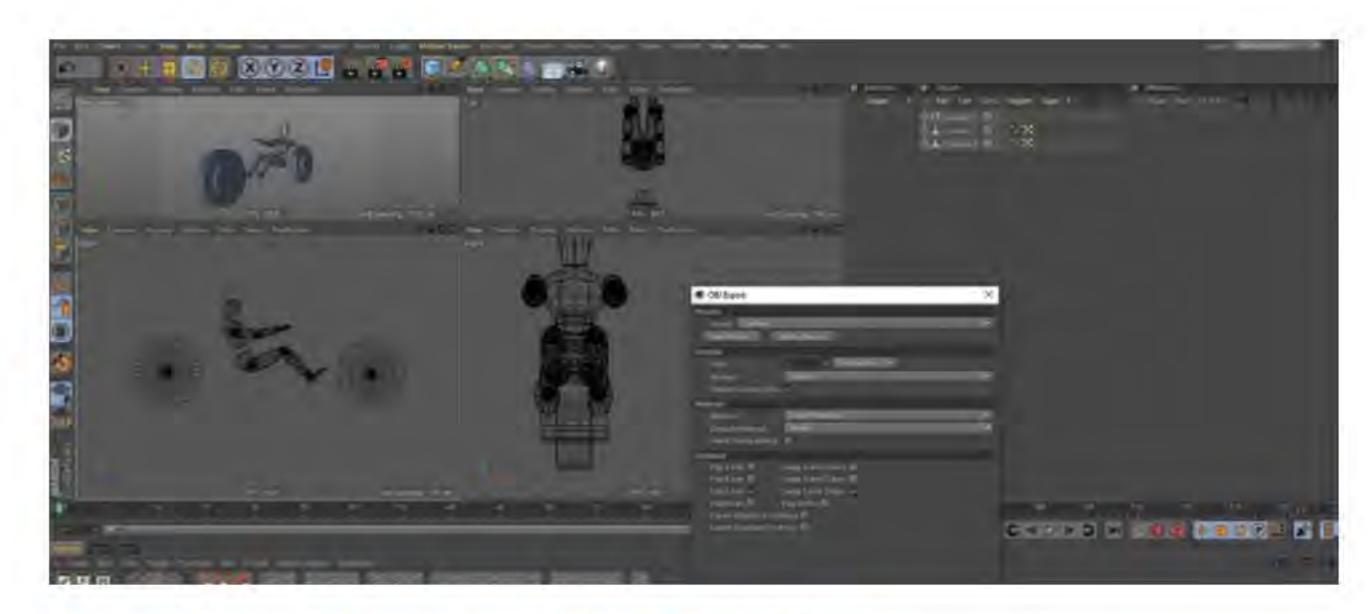
DOWNLOAD YOUR RESOURCES

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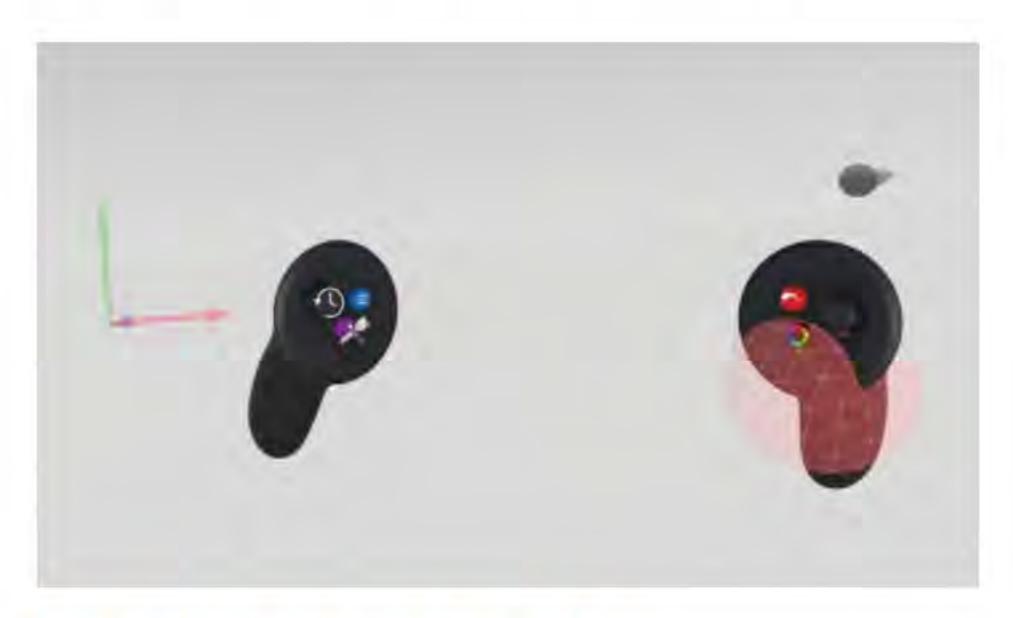


CREATE A BASE FORM IN 3D As the bike has a unique proportion with its large wheels and reclined rider position, it is a good idea to block out a simple shape in a traditional content creation application such as Cinema 4D. A simple maquette model was downloaded for free from TurboSquid, and then manipulated into the position of the rider using a background image from the internet as reference.



PREPARE THE MODEL FOR EXPORTING

Gravity Sketch can import models using the OBJ format. To export the model from Cinema 4D make sure to check that 'Swap Y and Z Axes' is ticked to ensure Gravity Sketch will orient the model as seen in the Cinema 4D viewport. Using trial and error, it seems that exporting using the centimetres option works best with importing into Gravity Sketch; if other measurements are used there can be issues with materials. Make sure to export the file to the Import Library folder of the Documents>Gravity Sketch folder.



UU On initial launch, Gravity Sketch appears as a white infinite space, but there are other environments to choose from. The Touch Controller appearance can be modified, but that can have an impact on performance, especially if using them in transparent mode. So it is probably best to stick with the default look, unless using the latest hardware.



THE RIGHT-HAND 'CREATE' CONTROLLER

The right-hand controller is the 'Create' controller. Think of it as a pen nib for sketching (hand functions can be switched if left-handed), and also the primary manipulator of objects. The red sphere that surrounds the controller is the grip sphere, used to select objects that have been created. On the Oculus Rift, the radius of both the 'pen' and the 'grip' is controlled by the right joystick - left and right for pen size and forwards and backwards for the grip. The remaining buttons are used for single-step undo and selecting colour.



The Oculus Rift setup used in this tutorial used three sensors to create a room-scale VR setup. This allows an artist to reliably move around the Gravity Sketch environment without losing tracking, and is recommended.



The other controller, in this case the left-hand

controller, contains many more tools. The triggers act as a right-click, the joystick acts as a backward and forwards history tool for editing, but it is the two top buttons that hold all the main tools. Scene and settings are accessed via the blue button and the artistic tool selection is accessed through the purple button.



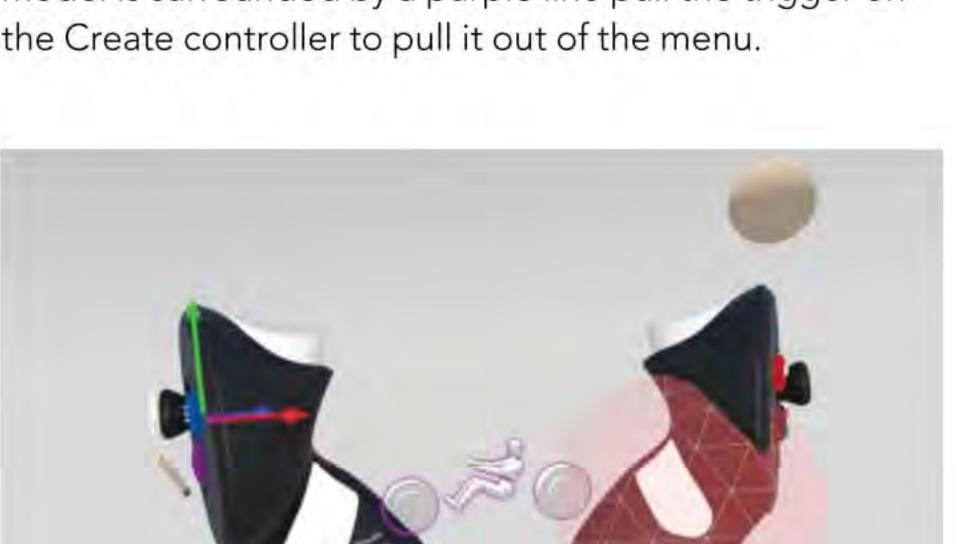
ACCESS MENUS

Using the Tool controller, select the blue button and go to the Prefabs selection, which looks like a dressmakers dummy. Select the middle bottom icon to choose the 'Import OBJ files' command. To select anything within Gravity Sketch, use the Create controller by simply pointing at the selection, whereupon a virtual pointer will appear from the front of the Create controller.



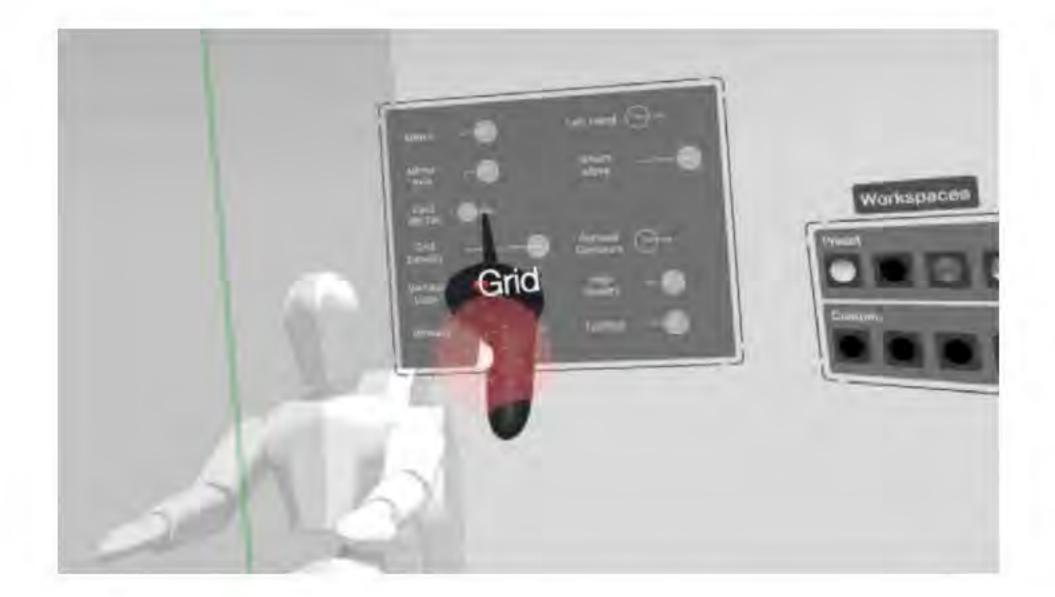
7 BRING IN THE OBJ

Once the OBJ file has been selected (making sure that the file had been correctly placed in the Import Library in Documents>Gravity Sketch), the name should be replaced by a small 3D representation of the model. Move the Create controller close to it, and when the OBJ model is surrounded by a purple line pull the trigger on the Create controller to pull it out of the menu.



O SCALE THE MODEL

Pring both controllers up to the model, select the Create trigger first when the model turns purple, then the Tool trigger, and pull outwards with both hands. The model should scale up with the physical distance of the hands. This scaling also works with the environment as well, and the scene can be orientated and scaled by pulling the second trigger of the Tool hand first.



1 1 PULL OUT MENUS AND THE GRID

We may need access to some other settings, such as the Grid which snaps objects to a 3D grid visible around the Create hand. The grid spacing can be adjusted and switched off from the same panel as the Mirror setting. To make sure the grid is always available just reach for it with the Create controller and a purple line will appear, allowing the panel to be pulled into the workspace.



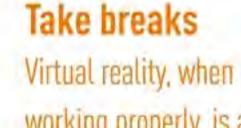
O SET THE MODEL IN THE SCENE

The model is tiny when it is brought into Gravity Sketch, and it can be picked up and dropped anywhere in the space by placing the Create controller near it. When the purple line surrounds the model, pull the side Create trigger and the controller disappears, and the selected element can be manipulated using the Create hand. Just release the trigger to let go of the selected object where you want it. Get used to dropping and picking the object up and reorientating it. This is guaranteed to bring a smile to the face of any 3D artist.



10 USE THE SETTINGS FOR SYMMETRY

The easiest way to create a sketch prototype is to use a symmetrical environment. Select the gears icon in the settings menu when the blue button is pressed on the Tool controller. Switch on the Mirror tool by using the Create controller to 'drag' the on-off slider to the right. A green and red crosshair should appear: this is the line of symmetry and our model needs to be placed across it.



working properly, is an immersive experience like no other. However, to make the most of VR, take breaks in the real world to reorient yourself and prevent any eye strain or motion sickness.



CREATE WORKING LAYERS AND ADJUST THE ENVIRONMENT

Press the blue button again to pop up the layers icon, which is three flat cubes, and pull the layers panel into the environment. Use the Create tool to press the larger '+' button twice to create new layers, and then touch a name of a layer to bring up the virtual keyboard. Name the layers as required for images, the base model and sketches. You may also notice another panel called Workspaces: this can change the environment by choosing the different spheres and there is a torch available for adjusting the lighting as desired.



Press the blue button menu again (if it has closed) to select the Reference Images icon. Choose the images that are required using the same purple-lined selection method with the Create tool and pull the images into the workspace. To place the images into the correct layer pull the images into the large box beside the layer name. This should snap images back to where they were picked up.

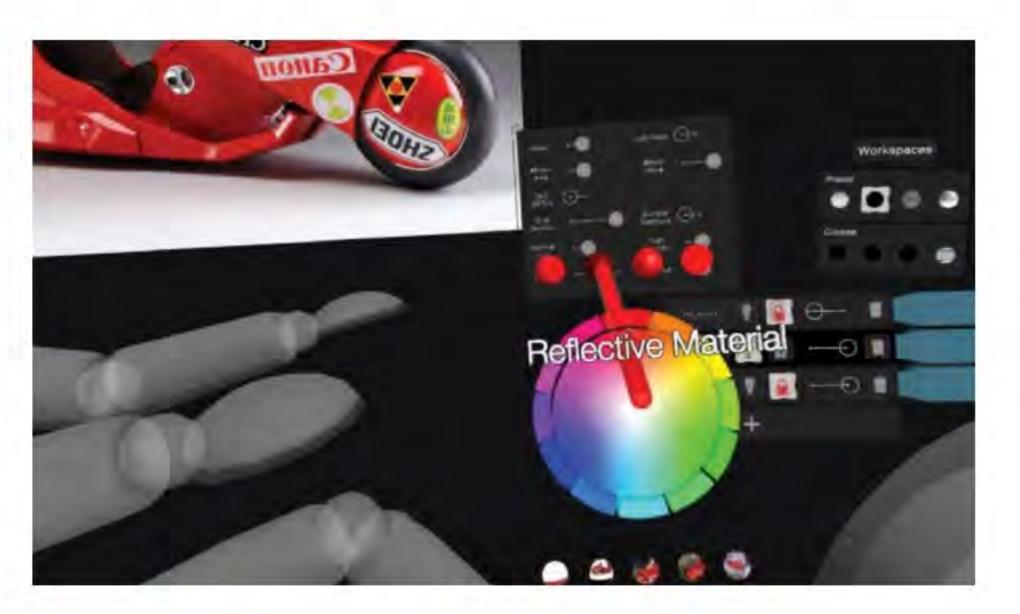


ORK WITH LAYERS AND ORIENTATE THE SCENE

Use the same methodology of selecting and dragging into the correct layer 'box' to place the imported OBJ into the base model layer. The visibility of layers can be adjusted via the circle and line sliders. Orient the scene to begin sketching; in my case making the model appear approximately a metre across and at waist height works best. With the Image Layer active, move and scale the reference images using the same methodology of the controller 'grip and pull' to place the images around the scene.

Use layers as much as possible

Gravity Sketch's layer system is incredibly powerful and allows the scene to be organised and at the same time fun. By having the layers palette always visible in the scene, objects can be placed and swapped between layers easily.



PICK A COLOUR FOR SKETCHING

Making sure that the 'sketches' layer is selected, press the Colour Picker button on the Create tool to pick a colour and material option. In this case Red Reflective is probably best as the purpose of this layer is to sketch out the primary forms. Press the purple tool button to make sure the desired Create tool is chosen – in this case it is the top line tool - and start sketching.



START SKETCHING THE BASIC SHAPE

To sketch, pull the trigger on the Create controller. When a line is finished, let go of the trigger. At this stage just block out the key shapes, as the actual model will be refined at a later stage. As symmetry is selected a mirror of the sketch should appear on the other side. When sketching the seat and the glass make sure to choose an appropriate colour.



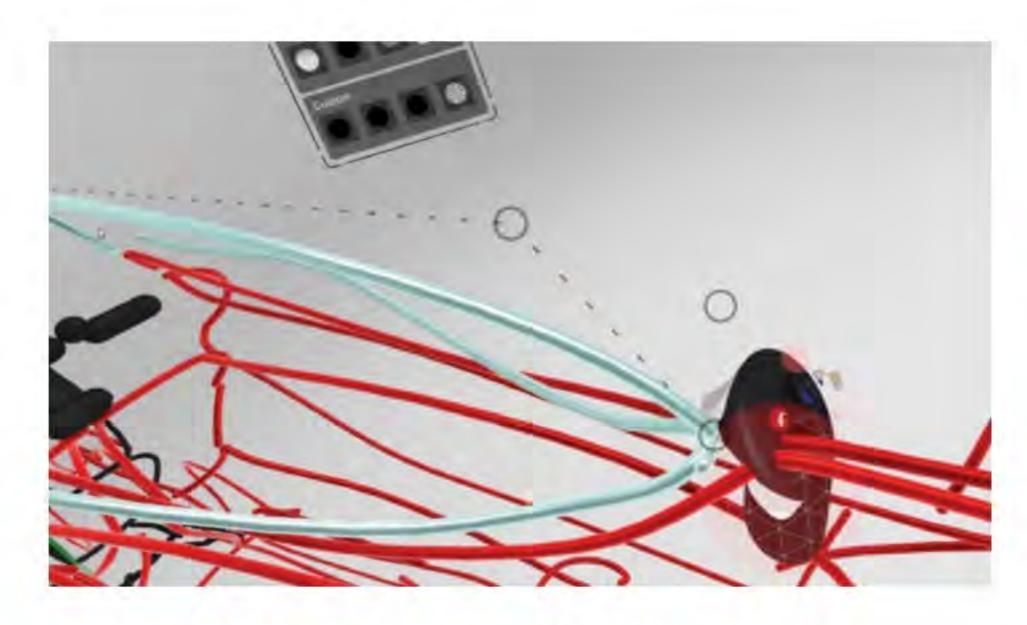
7 LEARN TO WALK AROUND

Make the most of working in VR by walking around the model as it is being sketched, as this really helps when trying to create a sketch line. Remember that the Undo button is available on the Create controller and the History can be rotated on the Tool joystick to move back and forward through the sketched line creation. Use the 'grip and pull' technique to shrink and enlarge the scene to allow any part of the model to be accessed in detail, and to also allow a bird's eye view to check the overall form in seconds.



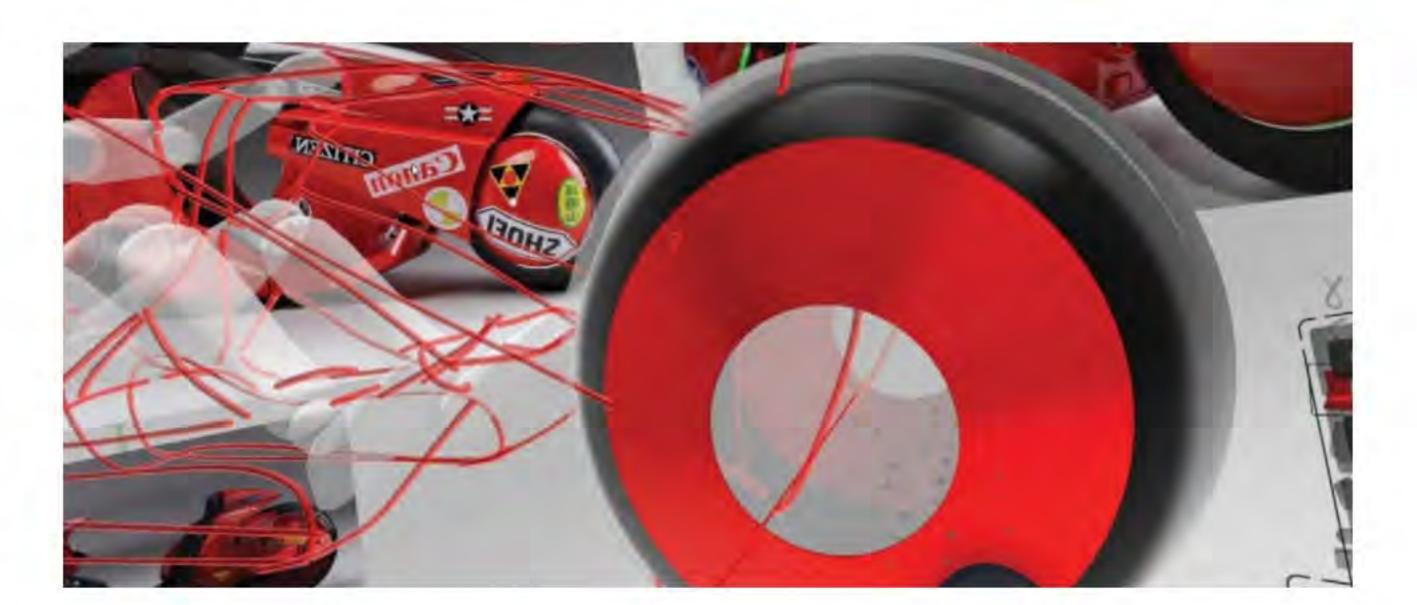
START TO REFINE THE SKETCHES

To refine a sketch line, highlight it with the Create tool. Any sketch line can be moved and scaled as needed, and the Tool hand will have a small icon of spheres connected by a line over the blue button; press this to enter the line edit mode. A new tool palette will appear with a button to smooth the selected sketch by reducing the number of control points.



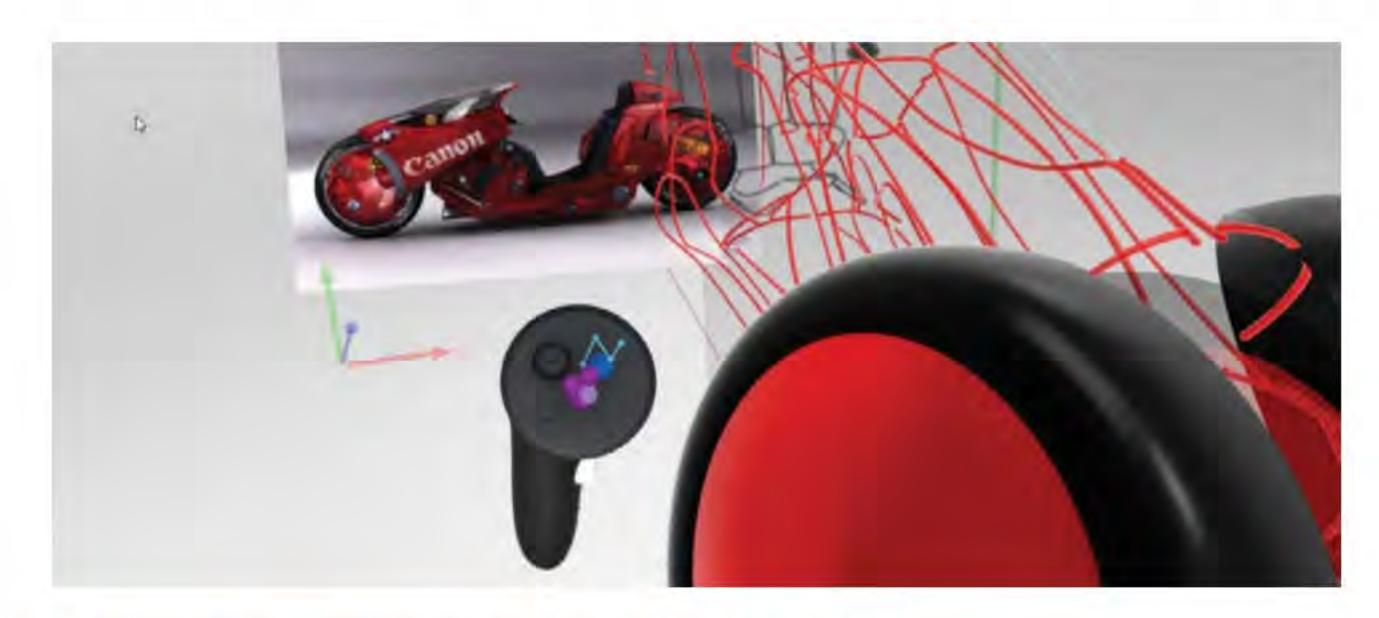
10 WORK WITH CONTROL POINTS

Refine control points by using the scale and rotate method to get 'within' the model. Moving the Create grip sphere, highlighted control points can be moved. Activating the Snap function will allow selected control points to snap to points on inactive sketches. To add a control point back move the Create tool over the dotted line, pull the trigger, then press the tick on the Tool hand.



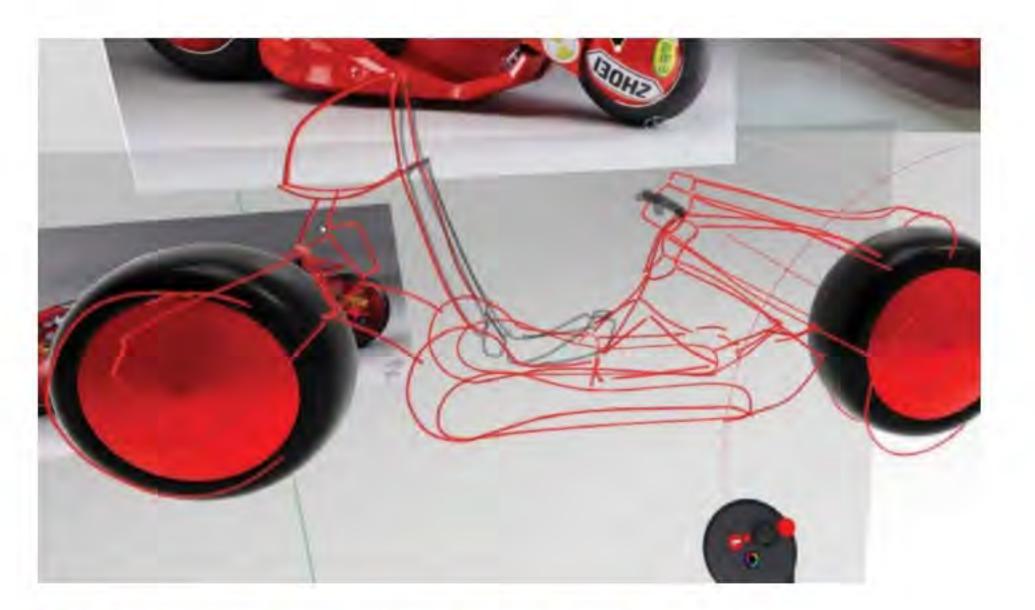
N BUILD THE WHEELS

Once the sketching is finished create a new layer for the modelled elements. Lock the other layers and slide back the opacity to start creating the model elements. To create the wheels, select the Revolve tool from the Tool controller and with the scene snap and grid on, use the Tool hand to place the 'centre' line of the wheel in the correct position. Then use the Create tool to pull out the wheel either as a freehand sketch or as a trigger-release curve. Create one revolve for the tyre and another for the wheel hub.



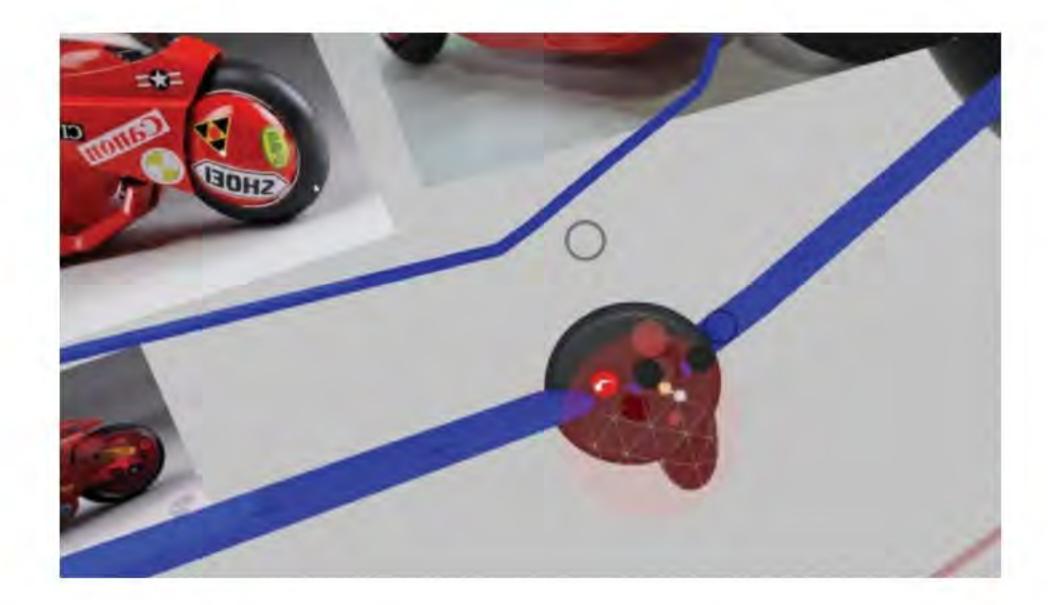
7 1 REFINE THE WHEEL SHAPE AND GROUP

Revolve objects can be adjusted just the same as sketches, by clicking the blue button on the Tool hand to access and simplify the control points. With Snap turned on, the hole in the hub can be easily sealed, and the curve of the hub and tyre profile adjusted as required. To create the rear tyre, exit point mode, then select and 'group' the hub and tyre by selecting them both and pressing the purple button on the Tool controller button, which should now show the hexagonal tiled 'group' icon.



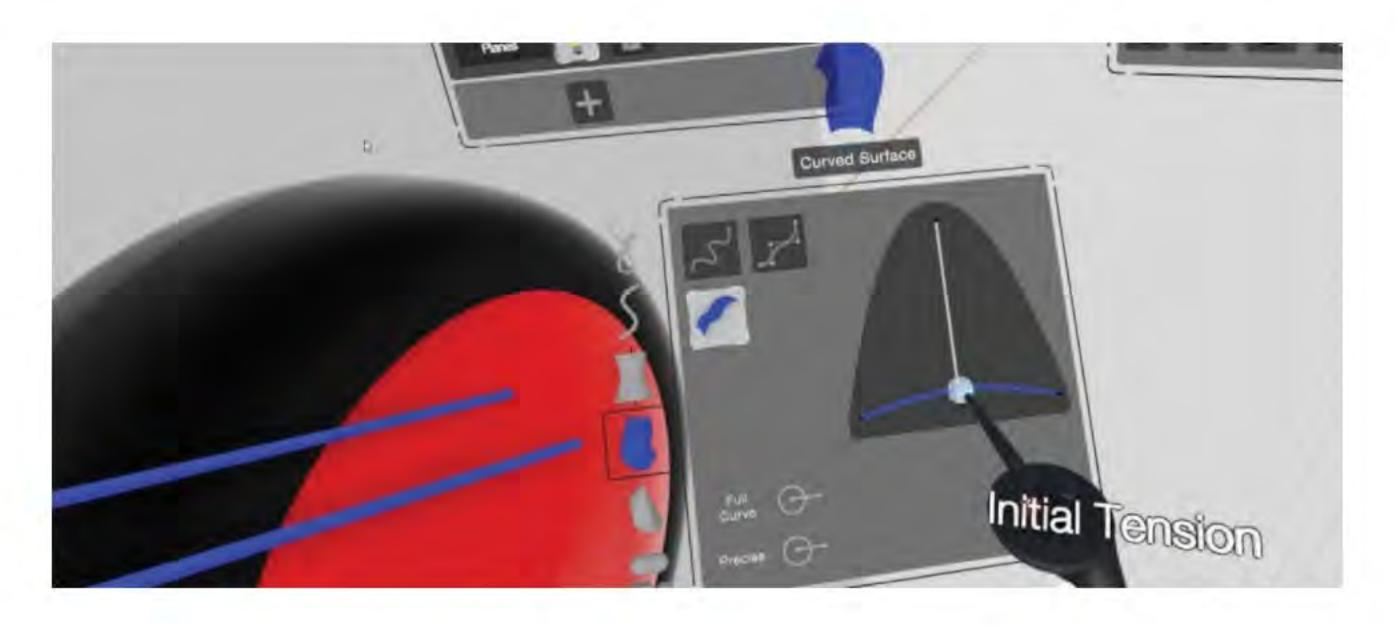
DUPLICATE A GROUP OR SHAPE

To duplicate the wheel group select it and pull the Create trigger once to leave a copy, then move the wheel object to the rear of the bike and drop it. Either wheel can be manipulated and edited separately. Double-check the wheels to make sure that a second copy has not been left. To delete an unwanted copy, select it and press the red undo button on the Create controller.



72 USE STROKES AS MODELLING GUIDES

Create a new layer called 'Guides' and select the Stroke tool to start creating simple guides to define the edge of the main components of the bike. Make these a separate colour from the model so that they can be easily seen. It is usually best to work in point mode for the creation of guides as it allows more control, using a trigger pull to create a new point.



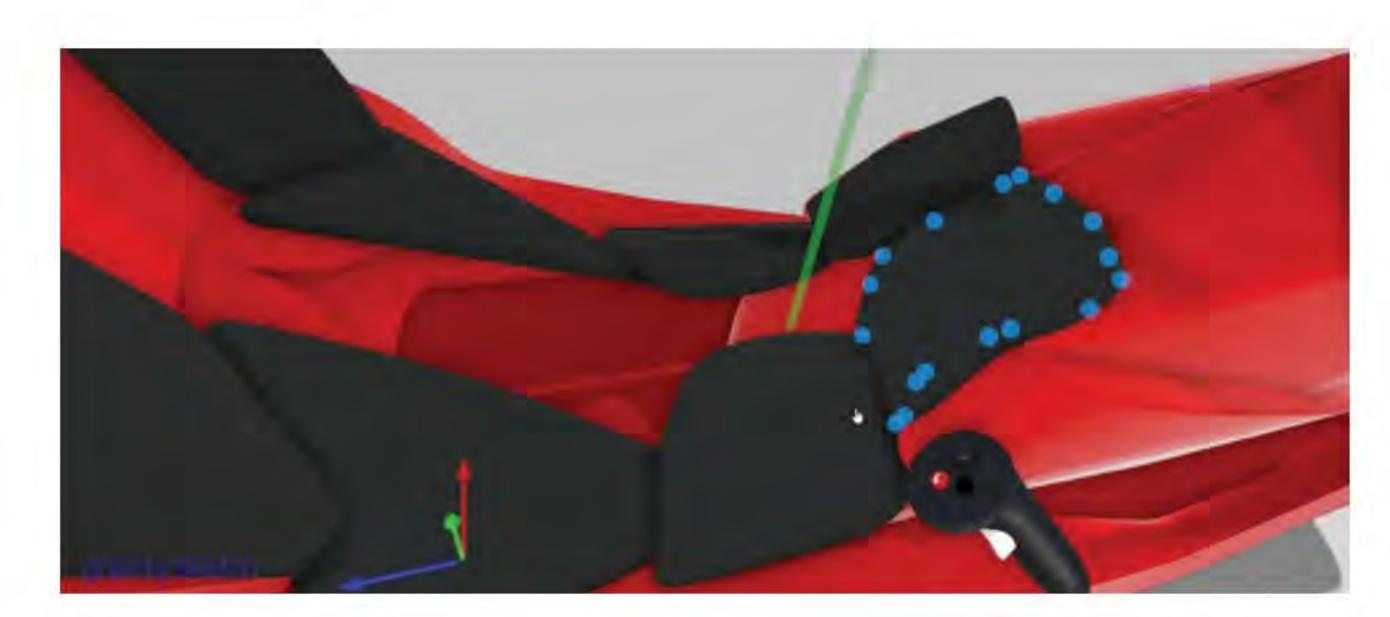
SURFACE USING THE GUIDES

Once guides have been set at the desired edge locations, surfaces can be created by using the Curved Surface tool. This tool creates a surface – which if the Bridge Curves option is selected can create a surface between two guide strokes. In fact, anywhere a stroke is highlighted in red it denotes the curve as being suitable to create a surface from. The tension indicator in the Curved Surface settings shows how much of a curve will be created in the middle of the surface, and can be adjusted as needed.



75 PULL OUT SURFACES

Use both the controller triggers to pull out a surface. Placing a surface can take a bit of trial and error, but like most other elements within Gravity Sketch, a surface can be edited and its control points accessed. With surfaces, edges can also be accessed by using the Create controller joystick when in edit mode where they show up as a green line.



JA USE VOLUMES

While using the guide and surface methodology is good for creating certain elements such as the fairing, for 'chunkier' elements such as seat cushions and the fuel tanks this would be laborious. Use the Volume tool as an alternative for these kind of shapes. Again using the point mode offers the most control and keeping three control points tightly together can allow complex shapes to be created quickly and easily. Again volumes can be edited with the control point method.

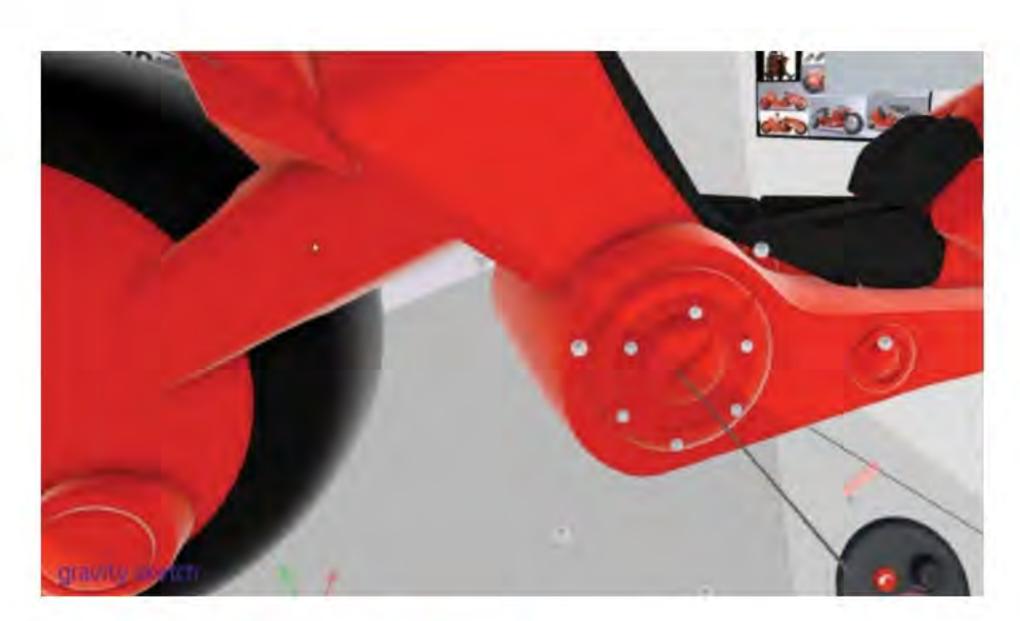
Create a proportionate model

One of the biggest challenges when learning Gravity Sketch is starting in a white space and trying to judge scale. That is why it is sensible to create a proportionate base model which can be imported and sketched over.



77 CREATE SMALLER ELEMENTS

Details can be added as the sketching progresses. Handlebars for example are created by adding a primitive cylinder from the bottom Tool controller menu. Then, use the Revolve tool to create and copy the grip elements. Snapping does not work with primitive objects so this needs to be done by eye, however, it can always be adjusted afterwards by selecting the newly created copy.



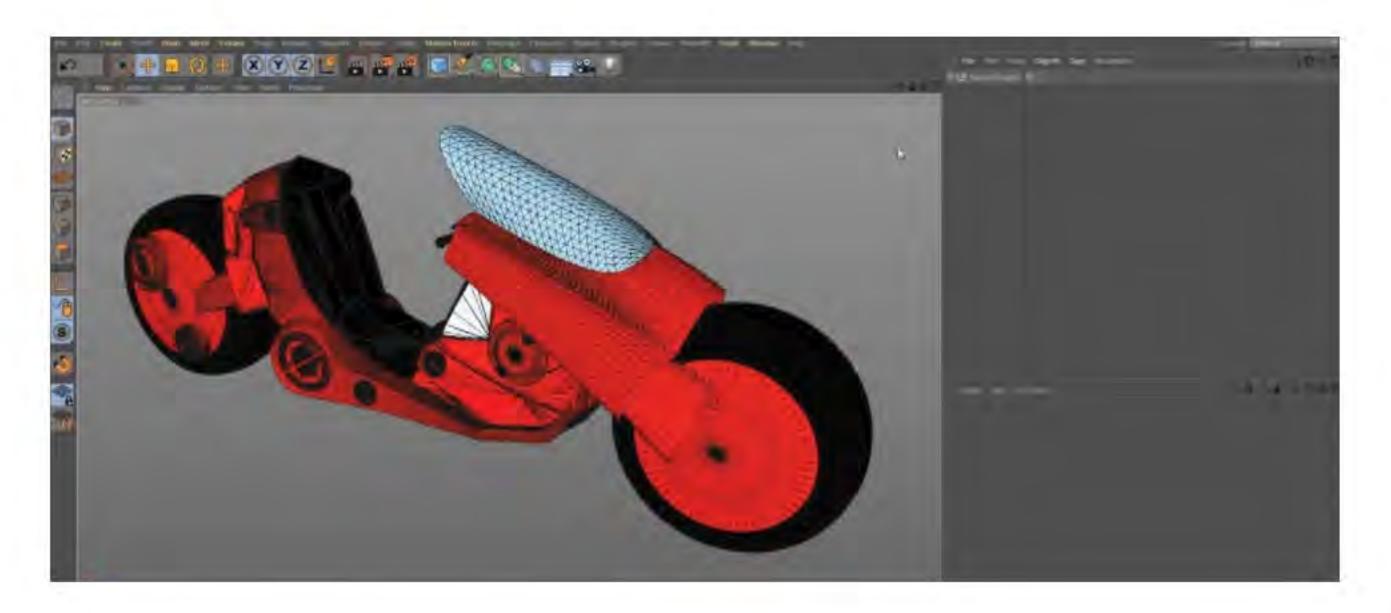
O ADD EXTRA DETAILS

Screws and bolts can be added by clever use of the Revolve and Stroke tool to create bespoke shapes that can be edited in position. Use the polar symmetry in the Stroke tool to create multiple objects from a central pivot and use the Revolve tool to make half and quarter lathed objects. Repeating these details and scaling them down can add character to the model.



70 PREPARE FOR EXPORT

If the model is off the ground plane this will be carried through in the export, so be mindful of that. Press the blue button on the Tool controller and select the Save icon, then the centre arrow in the top row to export the model. Choosing FBX format is perfect for the model export required as it will keep the material assignments.



MIMPORT THE GRAVITY SKETCH MODEL

When imported as an FBX into Cinema 4D the Gravity Sketch model is frozen, and has an object for each constituent part. This model could be perfect as a starting point for an animation or a more detailed model, which can make the most of the more advanced modelling features available within a full digital content creation application. As a starting point Gravity Sketch can be a unique and powerful tool for model sketching and prototyping and makes VR a valid creation tool for 3D artists.



CG AWARDS 2019

The CG Awards 2019 celebrate achievements made in VFX and animation, as well as advances made at the bleeding edge of tool development.









TUTORIALS Sculpt a tank in VR









QUILL | OCULUS MEDIUM

SCULPT A TANKIN VR

Discover Oculus Medium's new precision tools with this two-part tutorial from Martin Nebelong



Martin Nebelong

Martin is a freelance artist living in Denmark. He has been working as a 2D artist for 15 years, but since he got his VR headset, 3D is becoming an increasingly bigger part of his work.

www.artstation.com/martinity

ince I tried Oculus Medium for the first time almost two years ago, one of my only concerns with the program was the lack of grids, guides and snapping tools. Basically, the lack of these tools meant that any time you wanted to make a building, a robot or any other hard-surface model, you'd have no choice but to simply eyeball the required angles. You could still get decent or even great results by working this way, but it took way too long compared to the time it would take otherwise. Now, finally, those tools are here with the recent release of Medium 2.0.

In this tutorial, which is part one of two, I'll take you through the process of creating a hard-surface model in Medium 2.0, utilising these new precision tools. I'll be sculpting a made-up tank, using various references found online.

We'll also take a short trip into Quill to make the tank tracks. Here I'll introduce how you can draw very precise shapes in Quill, and how you can then take your Quill scene and use it in Oculus Medium.

The tank sculpt itself took around an hour and 15 minutes, and every one of those minutes felt like playing a game. That's one of the things I love about sculpting in virtual reality – it's just pure fun.

After reading through this tutorial, you should be ready to explore the world of VR hard-surface modelling to begin making your own creations!

DOWNLOAD YOUR RESOURCES

For all the assets you need go to www.bit.ly/vault-242-keyshot

FIND REFERENCES decided early on to do a tank, because it just fits the hardsurface category really well and features lots of details. Since I'll be freestyling this one, I won't need specific tank references and can

pick and choose what I like. I find references and keep them on my secondary monitor off to the side of my workspace.

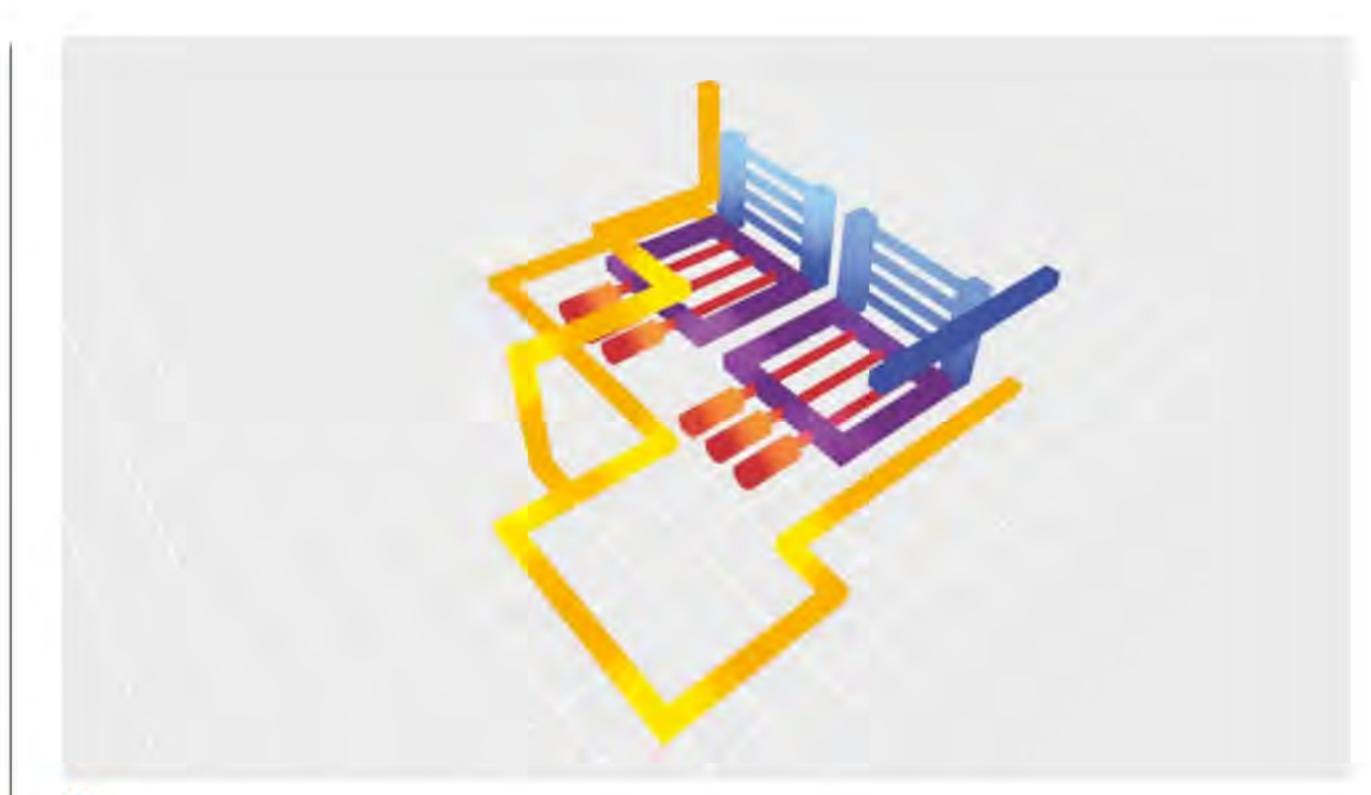
OUICK VISIT TO QUILL For the tank tracks, I decide to do a quick Quill drawing and use that in Medium, where I can turn the Quill drawing into sculptable clay.

Quill is amazing for quick, repeated details. You can now constrain lines to x/y/z by choosing the line tool and holding down the off-hand trigger, while drawing the line in the general direction you want it. A simple drawing like the one in the example would have been difficult to do in the previous version of Quill.

An important note when you're drawing in Quill with the aim of exporting to Medium is to draw with 'watertight' shapes, since Medium will otherwise have a hard time converting the geometry from Quill into voxels. So use anything but the ribbon brushes and the line brush and you should be good. Even with watertight meshes though, Medium might still have trouble converting very complex scenes.

Once you've drawn a line, select it with the selection tool (press X) on your controller, and make sure you've set the transform gizmo to show (press in on your left thumbstick if it doesn't). Now Avoid geometry flickering in Quill

If you draw a perfectly horizontal line in Quill, copy and move it off to the side using the gizmo, it will lay exactly on top of the original, resulting in geometry flickering. If you're doing a drawing in Quill and plan on keeping it there, you'll want to offset the strokes ever so slightly to get rid of the flickering.



02

you can snap-rotate the item while holding down the right trigger and dragging on the gizmo 'rings'. This will constrain the item to 15-inch increments, giving you more precise angles to choose from. You can also rotate freely on any of the three axes by pulling on the gizmo with the right thumb button pressed.

The best way to get comfortable with this technique is to draw random shapes and drag them around with the gizmo, rotating them in increments, moving the pivot point around and so on.

CREATE BASIC SHAPE OF FIRST TANK TRACK LINK

Using that technique, we're able to quickly form the first part of the tank track. Since there's no 'live' support for symmetry drawing in Quill, I find it easier to copy the line or shape I want to mirror, and just flip it using the angle-constrained rotate gizmo (hold right trigger while dragging).

The red box is actually me 'hacking' the system by drawing in Boolean shapes on a new layer in Quill. So the red box will actually be subtracted from the tread in

Medium, which is able to import the separate layers from Quill. To switch between layers, you can toggle an option to jump to the layer of the first object you select, under the selection tool in the tool menu.

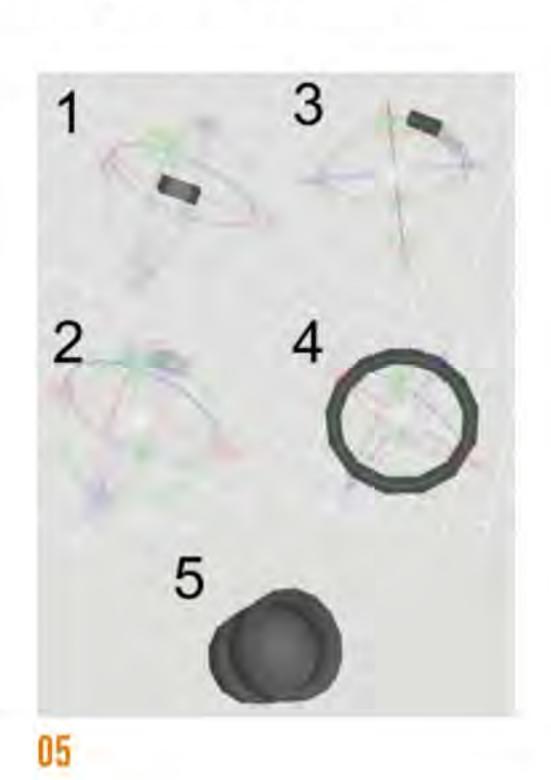
Let's make the tank wheels so that we can shape the tank tracks around that. To create a wheel in Quill, make a single horizontal line. Select that, and move its pivot point by holding down the thumb button on your main hand while dragging on the vertical gizmo line. Drag the pivot down far enough to reach the imagined centre of what will be the outer shape of the wheel.

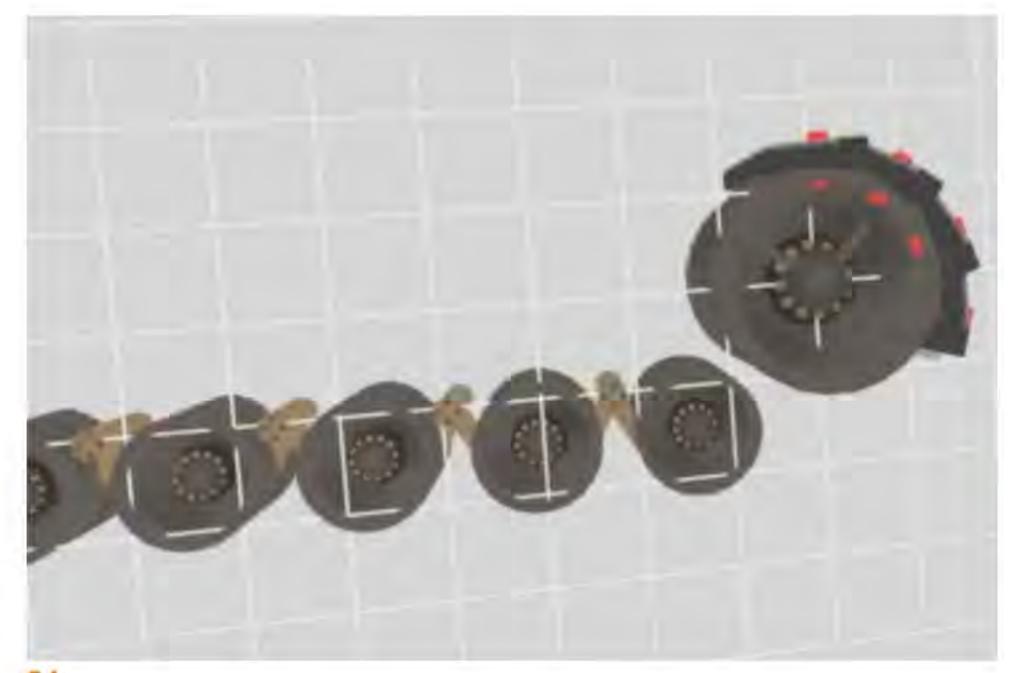
Now drag the line around the offset pivot point by dragging on the rotate gizmo with the right thumb button held down, while you also hold down your left trigger to make a copy.

Once we have a completed circle, we can give the wheel depth by selecting the circle and moving it using the transform gizmo while holding down the left trigger to make a copy. Once you've moved

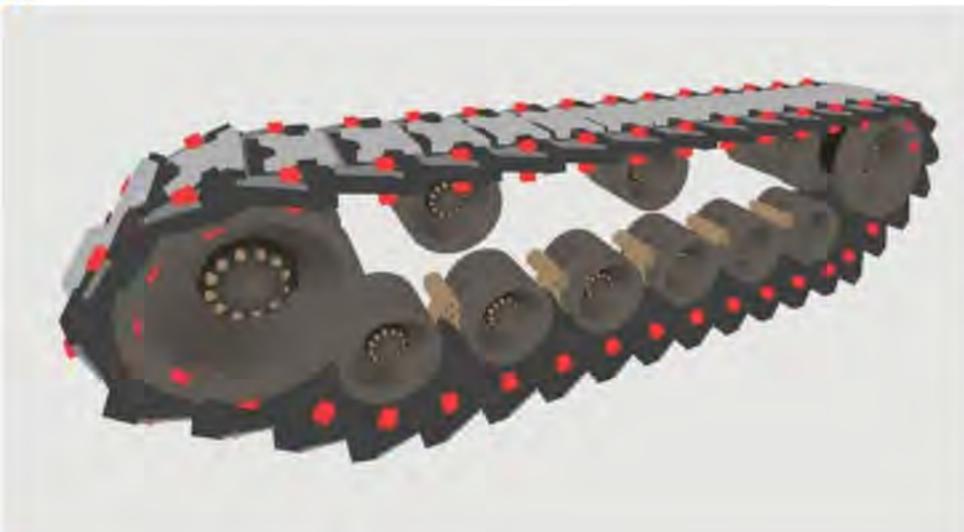




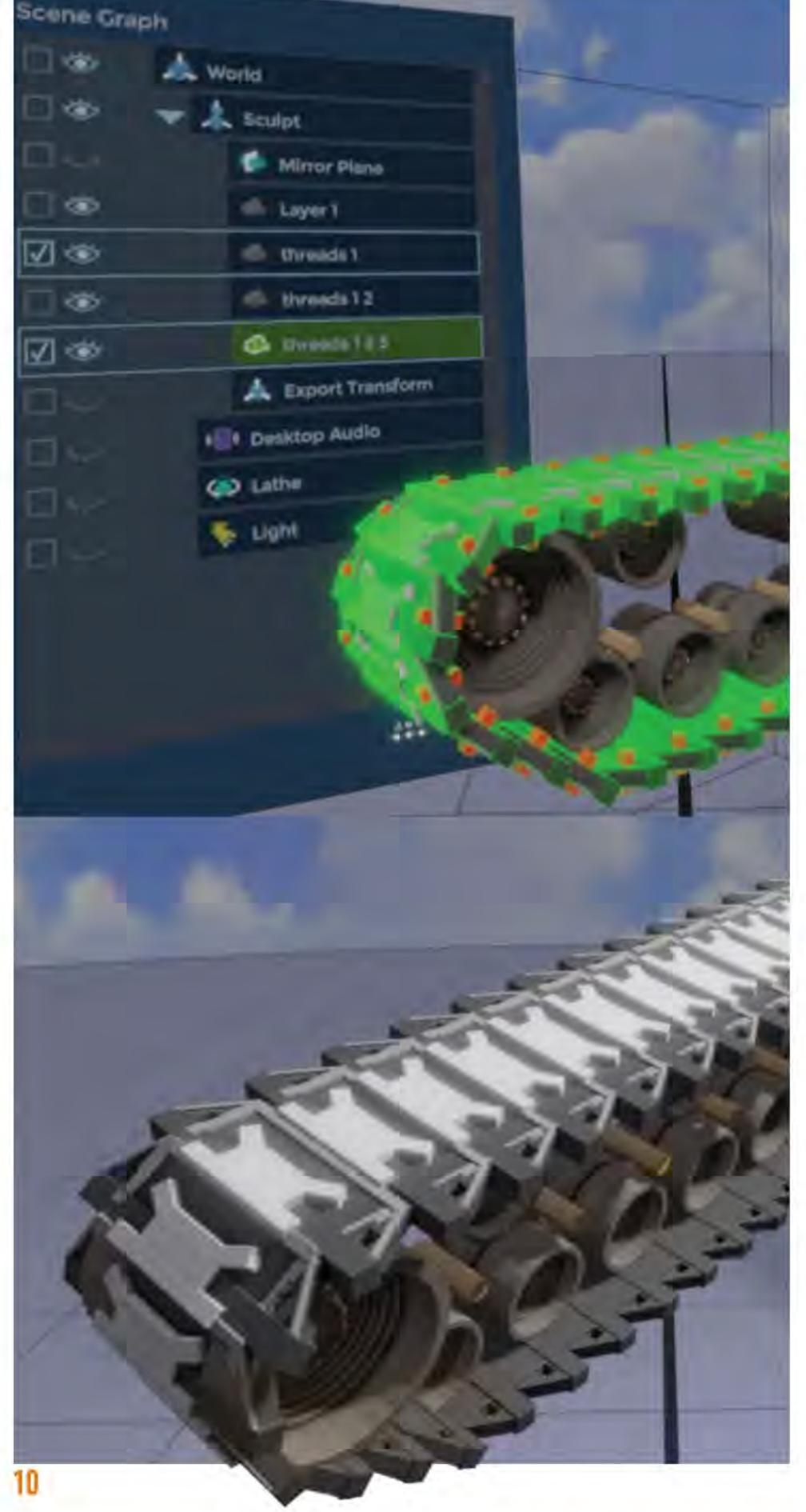




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it down far enough, just push your off-hand thumbstick right to repeat transform and copy. When you're happy about the outer shape, you can then use the square brush, combined with move/copy actions, to fill the inside of the wheel.

Now that you've seen how to make a basic wheel, it's time

to make a basic wheel, it's time to make the first tank wheel. I do this using the same technique and add small rivets to the inside of the wheel to up the detail level.

Now it's time to copy the wheel and make smaller versions for the lower part of the tank tracks. To make a smaller copy, select the whole wheel and hold down on one of the axes with the right thumb button. While doing so, push up or down on the right thumbstick.

Once I have the scale I need for the smaller wheel, I move it into place next to the large wheel. Then I make a copy of that wheel and drag it slightly to the left. I repeat the transform and copy action by pushing right on my off-hand thumbstick until I have the number of wheels I need. Using the line tool and the cylinder brush, make small mechanical connections between the wheels.

7 ADD THE TANK TRACKS

Now that the wheels are in place, it's time to make the tank tracks that go around them. Make a selection of the first tread we made, and copy that using the technique we used before for moving and rotating using the transform gizmo. In areas such as the bottom and top part of the tread where we have lots of horizontal repeats, use the left thumbstick to repeat transform and copy.

BEXPORT TANK TRACKSExport as FBX, and turn off
Export Curves, Export Animations
and Export Hidden. Exporting as
FBX will retain all layers in the file,
whereas OBJ exports will save
everything in one layer.

09 IMPORT THE TRACKS

Fire up Medium. Go to File and select Add Mesh as Clay. Now you're presented with a wireframe version of your mesh. There's a bounding box around the object that represents the layer bounds. The closer you scale this box to your mesh, the higher the voxel density will be, and the longer the conversion will take. I usually set this to around 80% or so which seems to work fine most of the time. Also check the Split Mesh Into Separate Layers box. If your imported mesh is very large, either scale it down if it's one layer, or scale the Export Transform object up. That will allow you to zoom further out.

SUBTRACT

Next up we want to subtract our subtractive Quill layer from the mesh. We do this by opening the scene graph. Then we point at the layer we want to subtract from and click to select it. Next up, point at the layer you want to subtract and click while holding down the left trigger to select that as well.

Medium then knows that the last clicked item is to be the subtractive layer. Next, hit the Subtract button.

1 MIRROR

Now that we have one set of wheels and tank tracks ready, we need to mirror that. So go to the scene graph, select the tank tracks and wheels (point with the laser pointer, click to select, hold down left trigger while clicking to select multiple items), hit Duplicate and then Mirror. Sometimes your mirrored items don't appear where you expect them to. If this is the case, the object you're trying to mirror is not offset correctly in relation to the mirror. One solution to try is to make sure the mirror is visible and then under its Transform settings, reset everything to zero or move items manually.

19 SCULPT THE HULL

Wheels as a guide, sculpt the hull of the tank. For this I use a square brush set to line, with taper turned off and continuous distribution. I enable Grid Snap, and find a fitting size for the grid. First I keep Angle Snap at 90, and when I have the overall volume in place I sculpt into that with lower Angle Snap settings, or even with angle snapping off. To quickly switch between adding or

TUTORIALS Sculpt a tank in VR



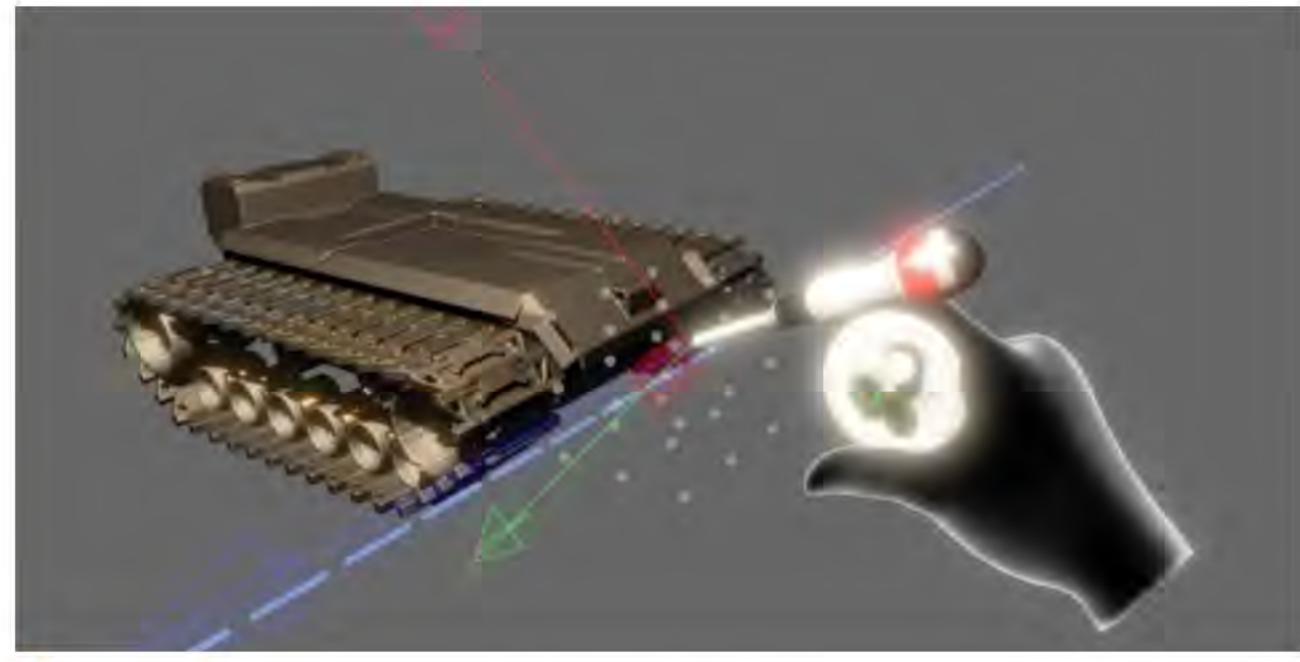
> subtracting, double tap A on your main hand.

If you find that your mesh looks too 'soft', increase the layer resolution by clicking the layer in the scene graph and pressing Increase Res. Be careful with this function though, and don't go overboard. If you were to fill a layer's bounding box with high details you'd very quickly hit a performance block. So if a large part of your layer doesn't need detail, but a small part does, consider breaking it up into a lowres layer and a high-res layer. It's also worth remembering that parts hidden behind other elements still eat up performance, so if you have very dense meshes hidden from sight, consider erasing those parts.

The next step is to add the armoured skirts of the tank. Make a new layer, and make sure the resolution is high enough. You can increase layer resolution before you even start sculpting. When you do so, you'll see a black sphere guide getting smaller and smaller. The smaller this is, the higher your mesh density. One of the most important things in Medium, in my opinion, is a good understanding of how resolution in Medium works, what it

Booleans in Medium

The Merge, Subtract
and Intersect functions
under layer settings
allow you to make
most shapes out
of just basic stamp
shapes in Medium.
Used in tandem with
the Duplicate function
and the transform
gizmo, you can easily
build up your own
hard-surface modelling
stamp sets.



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does for brush sizes, performance, export size and the like. Generally though, performance in Medium is great if you have a potent rig. I have a 1080Ti and have worked on very large and detailed scenes without any hiccups. For the armoured skirts, start out with a large box over the tank tracks. Then using the line tool, grid guide and Angle Snap, I remove most of that box and 'carve' out the cover. For the angled parts, I do the same and 'carve' out a plane similar to the one on top. Then I go into the scene graph, click the little transform gizmo symbol above the layer name, and rotate the plane using the rotation gizmo.

14 ADD DETAILS USING PREFABS

Add a new layer and up the resolution. Then go into the tool settings and open the Mechanical category. Find some fitting stamps, and again using grid and angle constraints with taper and continuous off, start placing details on top. All stamps can be used for subtraction too, so you can quite easily change the appearance of the basic stamps if you want a more unique look. While I sculpt in the details, I have a browser window open off to the side, using Oculus

Home's 'Virtual Screen' function. In the browser I search for a tank reference and loosely base my sculpt on that.

1 SCULPT THE TURRET I add another layer, and sculpt in the overall volume of the turret. For this initial blocking out, I usually go with the square stamp. I love how you can do both hard and soft edges with this tool, depending on how you angle the stamp. I keep the line mode activated and can quickly cut away, or add shape. As I start to see the form emerge, I choose smaller stamp sizes, and refine the sculpt using those. While I sculpt, I constantly rotate the model and zoom in and out to make sure the form reads well from all angles. I also now and then rotate the lights to see how it affects the shape.

We'll add detail to the turret in exactly the same way we did with the body of the tank. You can make your own hard-surface stamps if you like, but for this piece I go with the ones that come with the program. At the time of writing this tutorial, there is a bug in Medium when you use the Make Stamp function that offsets the stamp slightly, which

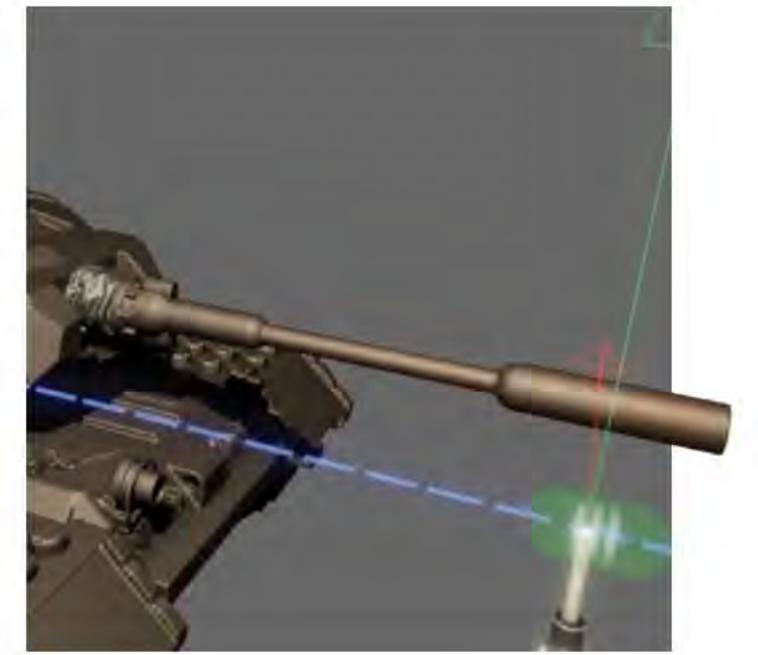




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3D WORLD January 2019





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makes the function broken for stuff like this. What you can do instead is make a new file, make your stamp using grids and angle constraints, export and then reimport using the Import Stamp function. A bit of a hassle but it works.

17 MAKE THE CANNON Time for the cannon. I make the barrel of the tank using the cylinder brush combined with the line tool. I cap off the end of the cannon using the square brush and make the barrel hollow using the cylinder brush again. When sculpting a model like this, I try to plan ahead for animation, or at least make sure I could rotate the turret and the gun. And now that Medium supports up to 100 layers, you don't have to worry too much about hitting the limit. I add a small piece of fabric-like material at the intersection between the barrel and the tank tower.

18 ADD RAILINGS
I want to add some small railings to the top of the turret, to make sure there's something to grab onto when entering the tank.
To do this we use the cylinder stamp set to line mode, no tapering and continuous mode. Angle snapping

Use colours as masking

If you plan on using your model in ZBrush (it might work in other 3D packages too), use vertex colour to mask out different materials in the same layer. Say you're making a dress with gold circles on it. Draw those with a contrast colour on your layer, and then add polygroups by vertex colour in ZBrush.

should be set to 90. Make sure your detail layer has enough resolution and draw a small line along the length of the turret. Then, using the Move tool with an inner radius of 0 and strength set to 100, we can shape the railing. I use a very large Move tool size for this, to get a more rounded shape on the railing. Once I have the form in place, I add small lines that connect the railing with the turret.

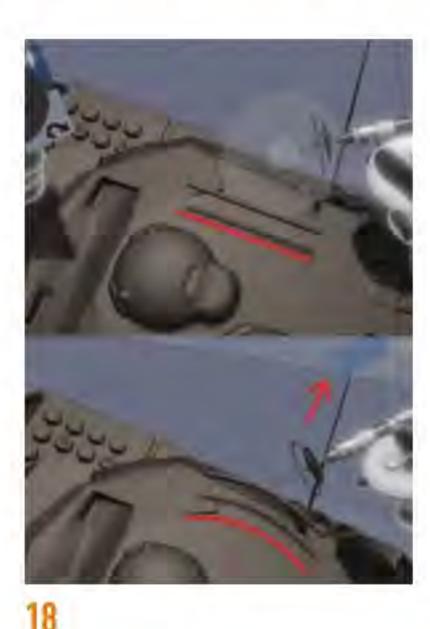
10 GROUND PLANE The work on the tank is now finished, so I add a new layer and sculpt a basic environment around the tank. For this I use a combination of rock brushes. I work at a relatively low resolution here, and add a new layer with some 'hero' rocks with higher resolution. When you're making environments like this, the Move tool with an Inner Radius of 90 or so works really well, for quickly dragging out a ground plane for example. Just remember to watch your layer resolution, as large environments get very performance-heavy if you have the layer set to high resolution. For very large environment pieces, you can sculpt a part of it, and then with the layer selected in the scene graph, scale the layer up in size.

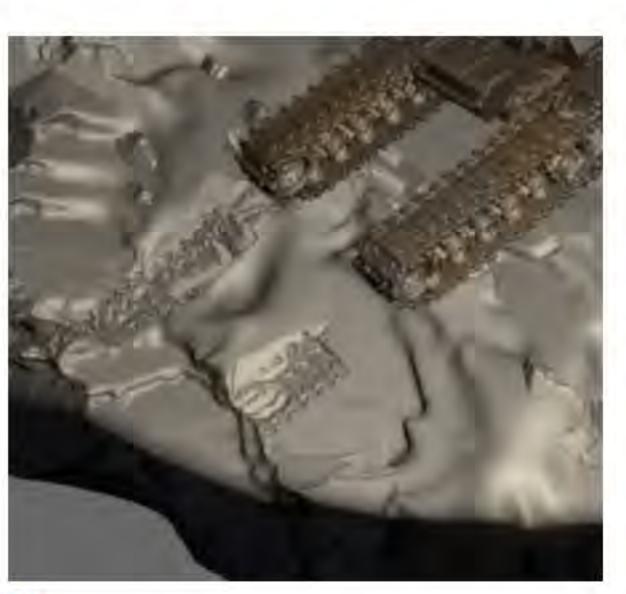
Tank Track Marks
To have some track marks
behind the tank, I duplicate the
tank track layer two times and place
the tracks behind the tank in a
meaningful manner. Then I subtract
those layers from the ground plane
and voila!

Now that we've come to the end of the first part of this tutorial, it's time to export the model. Before you export as FBX (which retains both layers and vertex colour), go through the layers and check if any of them could be lower resolution, if there's parts of layers that you don't need and can erase. And maybe, if you're a bit more organised than me, give the layers proper names.

After a few hours of sculpting and painting in Medium and Quill, I now have a very solid model for the next tutorial. There I'll be taking the model into ZBrush to optimise it by decimation. Then I unwrap each part of the model using RizomUV (formerly Unfold3D) and texture it in Substance Painter. I'll also be talking about different rendering options, both real time and raytracers.

As always don't hesitate to contact me if you have any questions about the workflow.





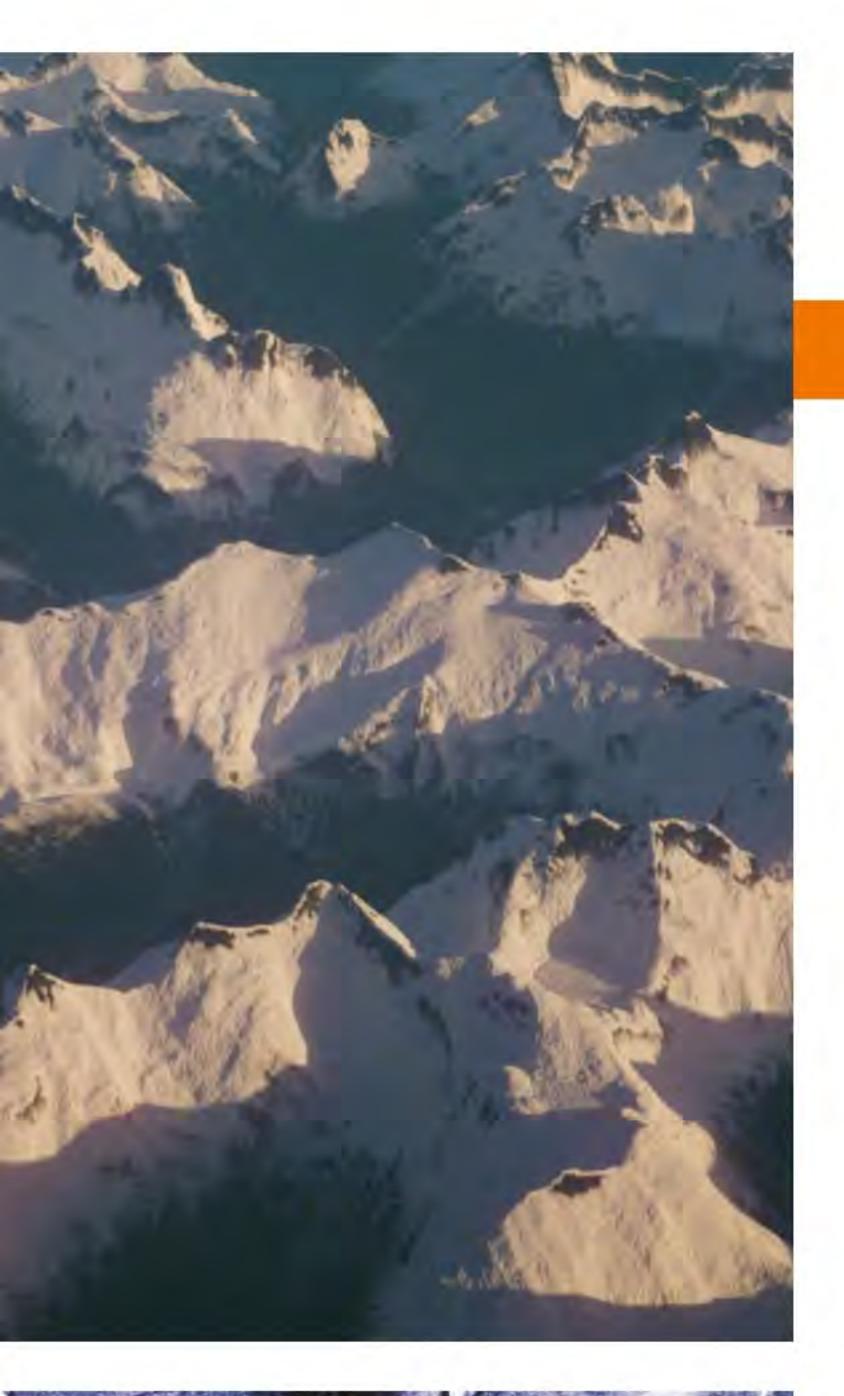


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HOUDINI | CLARISSE OR ANY RAYTRACER

CREATE LIDAR-BASED LANDSCAPES

Discover how to build procedural landscapes in Houdini using real-world elevation data from LiDAR surveys





Greg Barta

Greg is a VFX artist and scientist with a passion for cinematic scientific visualisations. Details, along with Houdini resources like the UI mods in these screenshots, are on his ArtStation profile.

scivfx.artstation.com

sing landscape generator software, and also the terrain module in Houdini especially with the enhancements in version 17 – we can effectively create fully procedural landscapes. However, none of these procedural workflows can compete with the complexity of the natural processes behind these landscapes in reality. Using real-world terrain elevation data as a starting point not only makes the result more grounded, but can also give you extra inspiration during the work. Although this may initially sound like a complex approach, you'll be surprised at how simple it is.

The renders shown in these tutorials are not finished projects, but study scenes, and are not complex setups. The goal is to create landscapes for look-dev, concept art or the base layer of

a matte painting, using just the elevation data and procedural shading, without any further or additional detailing.

In the first part of this tutorial we will learn some basic LiDAR concepts and how to convert this data into a more useful terrain object. While even the free Apprentice version of Houdini can export various geometry files, users of other 3D software can use it as a converter. The second part of this tutorial is software-independent, so even though I used Clarisse for the rendering of the snowy scene, you can use any node-based raytracer.

DOWNLOAD YOUR RESOURCES

For all the assets you need go to www.bit.ly/vault-242-keyshot

Create LiDAR-based landscapes

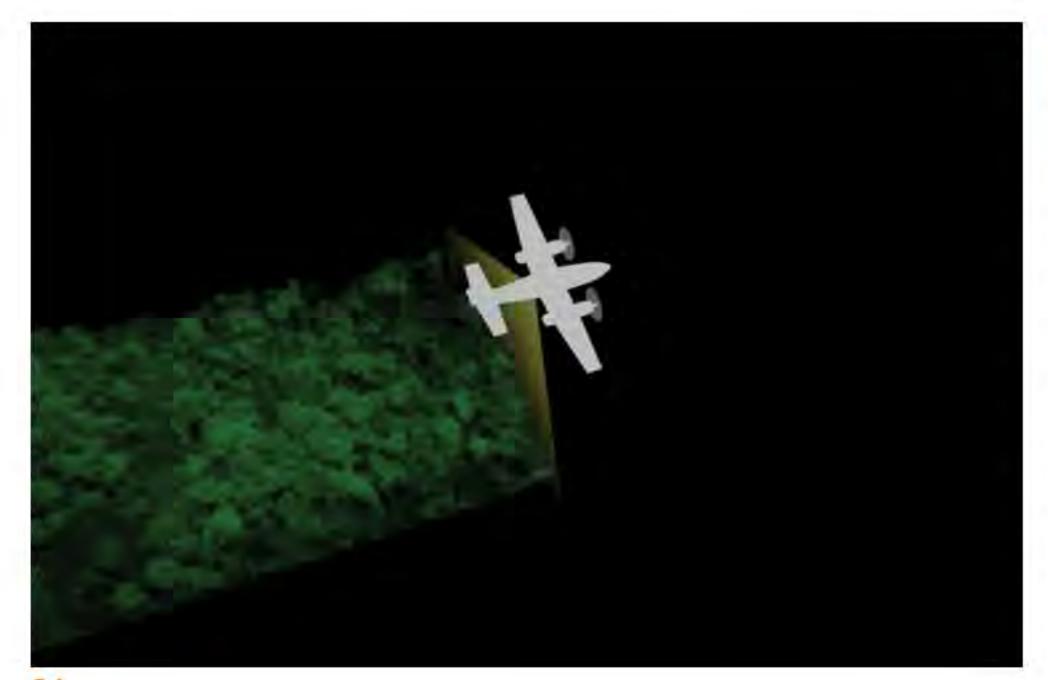
First we need to find somewhere that can serve as the basis of our landscape. Google Earth is a good tool for finding this inspiration, and we can get quite a good sense of the landscape.

QuantitaryWe need to find where can we obtain the elevation data of the chosen location. If we are lucky, it will be available online; there is a link list on my ArtStation profile of such sites. In this screenshot we can see the UK's official site for many types of earth science data sets: data.gov.uk. Here we can download not just the more well-known DEM (Digital Elevation Model) files, but also the raw point clouds of the measurements that came directly from the devices, usually LAS files.

WHAT IS LIDAR? LiDAR is similar to RaDAR (Radio Detection And Ranging), however it emits beams within the optical frequency range of the electromagnetic spectrum, thus the first two letters mean light in this case. While the speed of light is known, we can calculate distances if we use a laser light and a sensor that can detect the exact time delay of the reflected light pulse - similarly to how the laser rangefinders work. The main difference is that LiDAR equipment does this operation very frequently, some more than a million times a second.

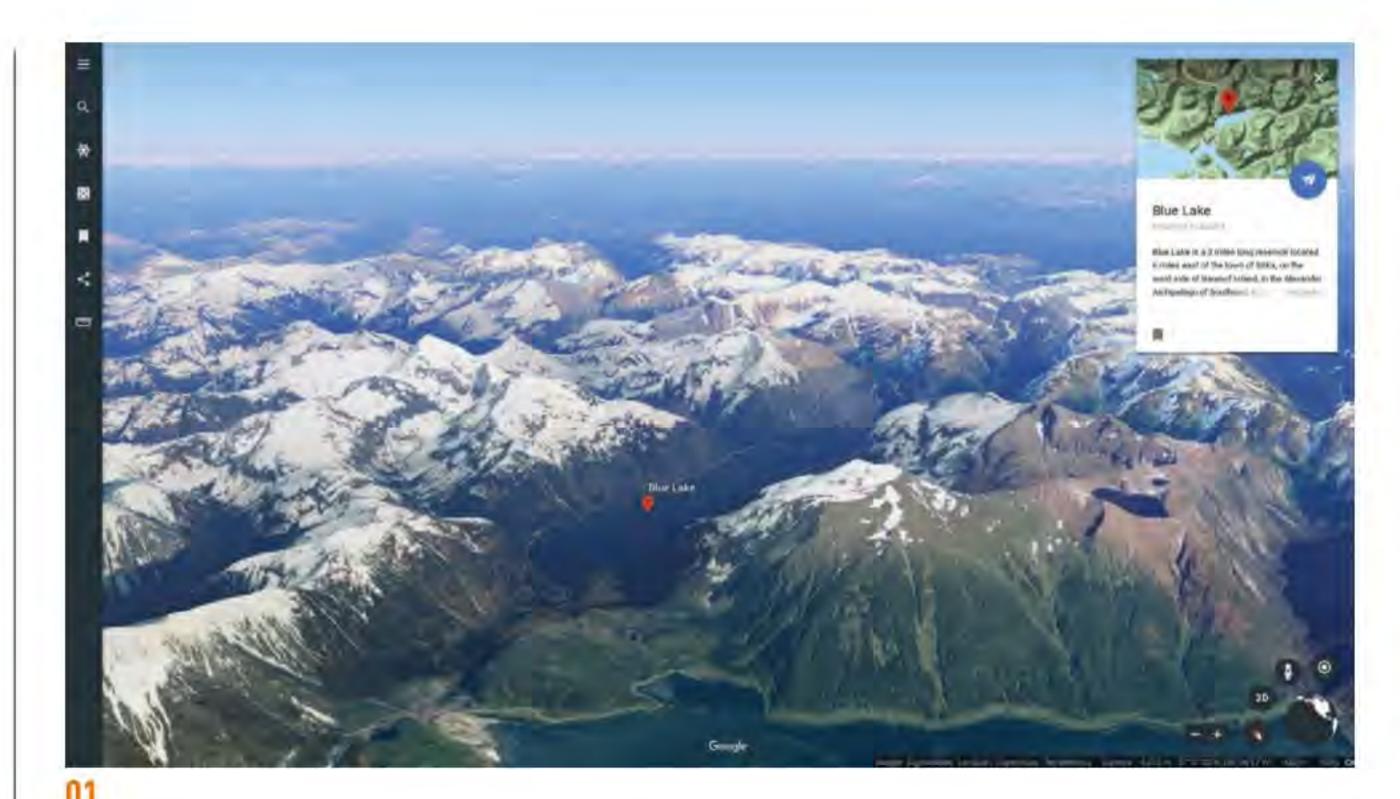
04 LIDAR FOR EARTH SCIENCE

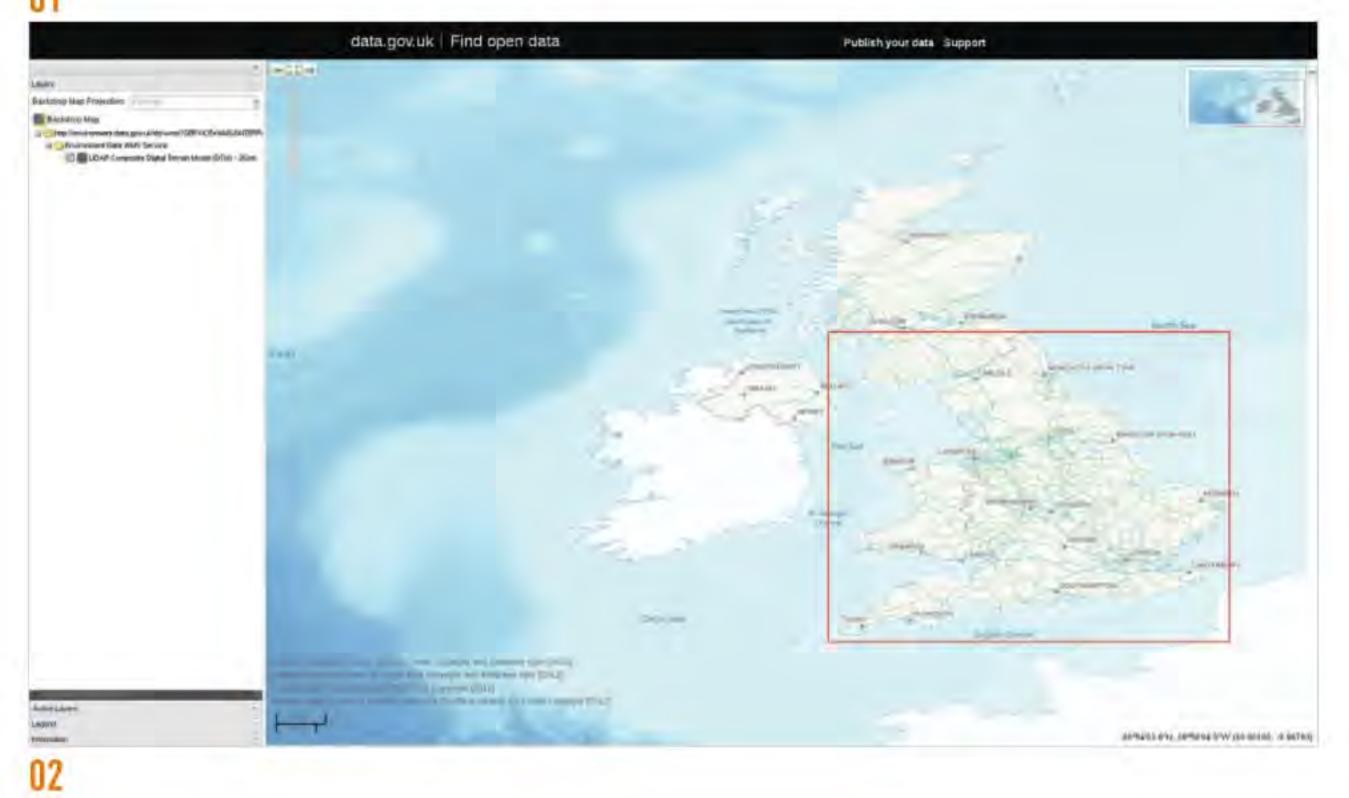
The usage of LiDAR in earth sciences is wide – they measure range and altitude, atmospheric



Memory management

When working with such dense data it's easy to reach the limits of our system, but we can minimise Houdini's memory footprint by deleting unnecessary attributes of the input nodes, and limiting and/or reducing the number of points.





vertical profiles of aerosols and gas densities, temperature, cloud cover, wind velocity and direction, shape and size of landscape features, height and density of forests, sea surface roughness and so on. These devices are used on aeroplanes or satellites to cover large areas.

We need the height measurements for this tutorial, however some other data can also be a good starting point even for a VFX artist or game developer. This image is from a NASA Goddard visualisation, links are available on my ArtStation.

Luckily Houdini can directly import the LAS files with the dedicated Lidar Import SOP node, so we don't need to convert them with GIS software – used by earth science professionals. The problem with this direct import is that these point clouds are basically raw data. Similarly to a raw photo, they contain all the original data of the acquisition, even errors and noise, so we need to process them for

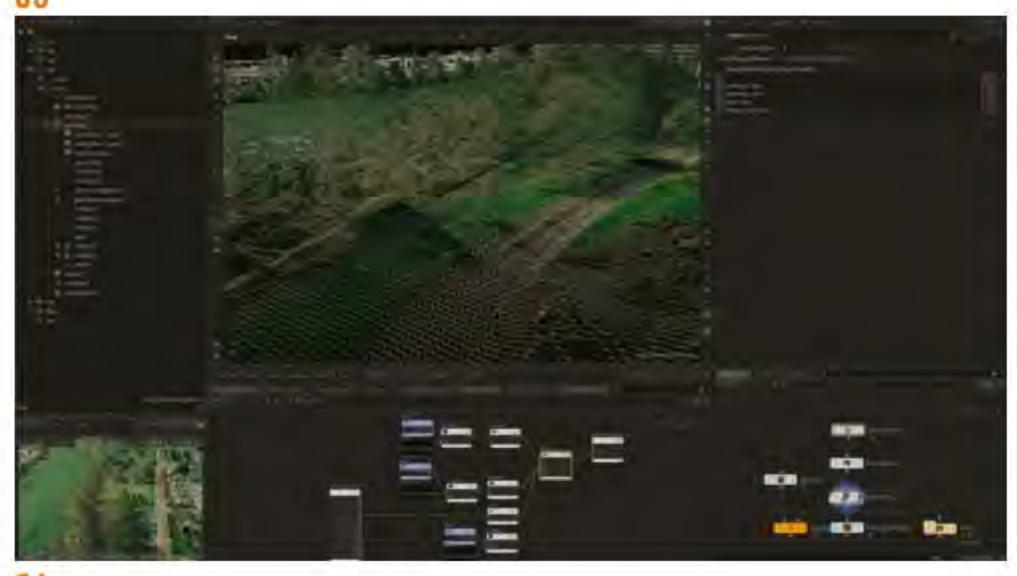
further uses. If the extension is LAZ, it means that it's compressed, so we should first convert this to LAS as Houdini reads just the last format.

Even if Houdini is a VFX software, we can use various SOP nodes to achieve similar data processing methods to what GIS software can provide. First we should use a Transform node to orient the Z-up coordinate system to Y-up, then move the point cloud to the origin of our scene, otherwise they might be thousands of miles away. They usually use the Cartesian coordinate system, and the curvature of the Earth with the usual sizes doesn't matter too much, so for CG work it's okay not to worry about this. However these LAS data products provide metadata files with the downloads, which are basically the documentations and/ or logbooks of the acquisition and include the coordination system.

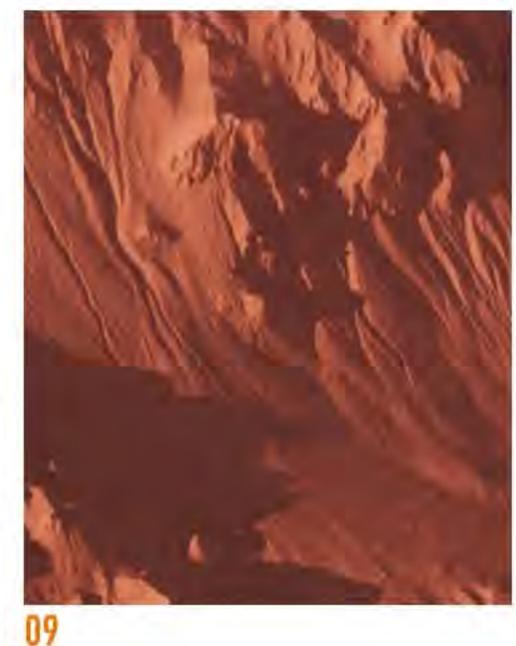
As usual with LAS point clouds, some points are close to each other, so we can use the Fuse node to



05







snap them together and another one to merge them (or consolidate in Houdini terms). This not only averages the noise of the individual data points, but it also simplifies the parts of the point cloud that are too dense.

The Lidar Import node can also read some additional attributes of the points like return count and return index, not just the coordinates. However to get the most valuable attribute of the LAS format, the classification, we need to use GIS software for conversion. We can use classification similarly to the shop_materialpath attribute, but it has an official standard of assignments, and pertains more to the category of the object than the material of it. However we can use it not just for defining materials, but also to drive scatterer nodes to lay down trees, buildings and so on

regarding the real-world layout.

The DEM format is more familiar for CG artists as it is preprocessed and more easy to use. They are usually available in a special TIFF image file format, which stores the elevation data for every pixel. In a nutshell, using CG terminology, these are orthographic top-view P.z AOV renders of the 3D elevation models, which are based on the LiDAR point cloud. There are two types: the DSM refers to the surface model and includes all the objects like trees and buildings; the DTM is the terrain model which is a cleaned-up version using just the LiDAR returns from the ground, and the occluded areas are interpolated.

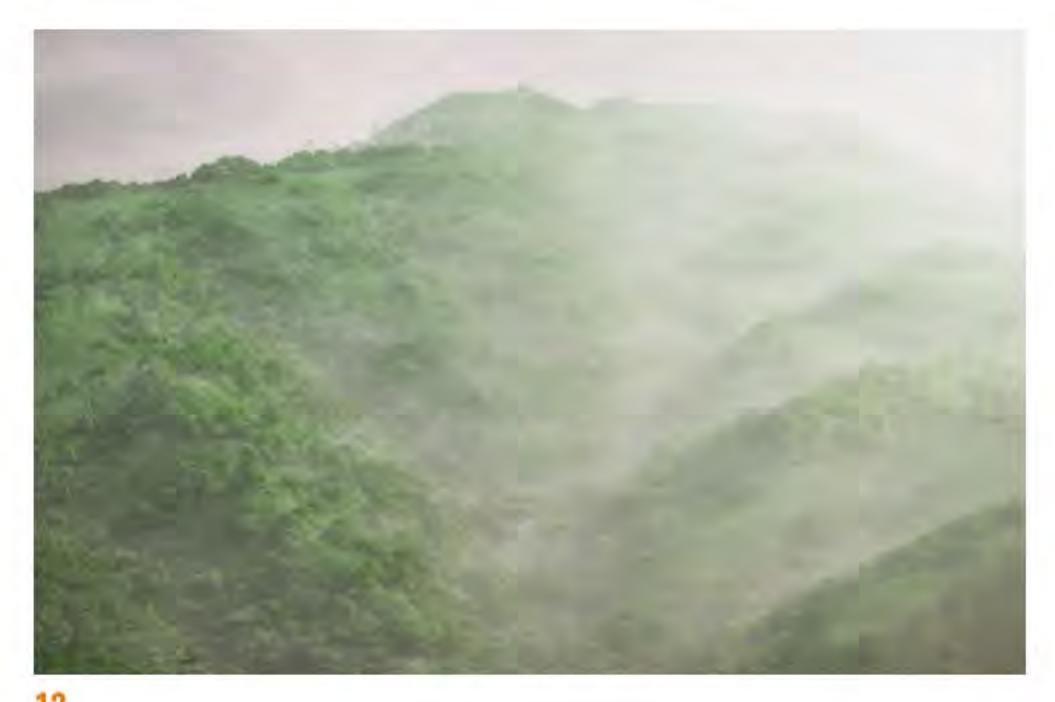
O OTHER PLANETS

While so many VFX and game scenes depict surfaces of alien planets, it's likely that we can't find appropriate landscapes in Google Earth for such uses. However, there is the option to switch to other planets like Mars. There are enormous amount of landscapes freely available, many with 1m resolution – check out the resources page on my ArtStation site for relevant links. This render is based on a NASA data set.

Houdini offers so many options for processing the LiDAR point cloud further and generating a more useful terrain surface. Luckily developers improved the Triangulate 2D node in Houdini 17, which is much faster and ideal for converting our point cloud elevation data to a polygonal surface. This is the most similar method to that which scientists use to convert the data to DEM formats. We should switch on the Restore Original Point Positions parameter to get the expected result. Point Cloud Iso is the dedicated node for converting scan data to a surface, but it needs normals on the points which we don't have with LAS files.

CONVERT TO SDF SDF (Signed Distance Field) is kind of an intermediate state between volumes and surfaces. It's based on volume voxel grid but instead of storing the density for each voxel, it uses a distance value in each voxel, defining an implicit surface. So let's try it and convert our point cloud with a VDB from Particles node using the Distance VDB setting. To render this kind of geometry we can either convert it to polygons or if we use Mantra, there are parameters under the counter we should add to the OBJ container node: vm_volumeiso and vm_volumedensity.

12 KEEP THE POINTS
We can directly use the points as particles or instanced spheres for rendering. Some data sets are so dense that at particular distances it can work well, at least for quick look-dev purposes or even for scientific visualisations. With

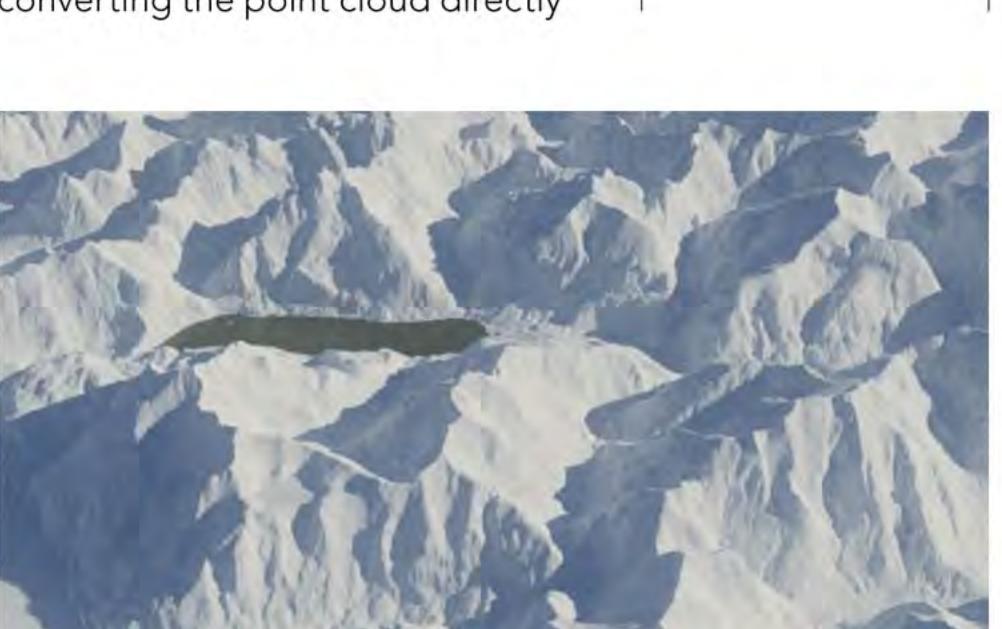


> vegetation, this kind of direct usage makes the look more organic than the polygon surface. In Houdini the most memory-efficient way is to create a Copy to Points node and switch on the Pack and Instance parameter, then create a Sphere node with Primitive type and use it as an instanced object.

The most ideal combination of the previous conversion options is to use metaballs. The points work like the droplets of a 3D printer the metaballs stick together and fill the gaps between the points automatically. It is quite simple to achieve, we just need to create a Metaball SOP then use a Copy to Points node to scatter this metaball on all the points, and tweak the Radius and Weight parameters of the Metaball node to get a coherent surface. The GEO container node's Geometry tab has a Metaballs as Volume option. It's worth a try for rendering distant vegetation.

For further enhancements and detailing the best method is to use the native terrain format of Houdini, the height field, but converting the point cloud directly

16



Volume of interest

It's also important to use just the area of interest and delete all other points. Use a Group node with a bounding box selection around this area, then blast the others. This cleanup is worthy in all cases, otherwise some far-away erroneous points can cause big troubles later.



is a bit complicated, so it's better to use the output of any of the previous conversions. Height field is basically similar to the DEM format, but the 2D image that stores the height data (technically one layer of volume voxel grid) is automatically rendered/visualised as a 3D geometry. If we have a DEM file, we can simply use the HeightField File node to import it directly. To convert the previously generated LAS-based geometry, we can use the HeightField Project node.

It's worth doing some test renders with simple shading and

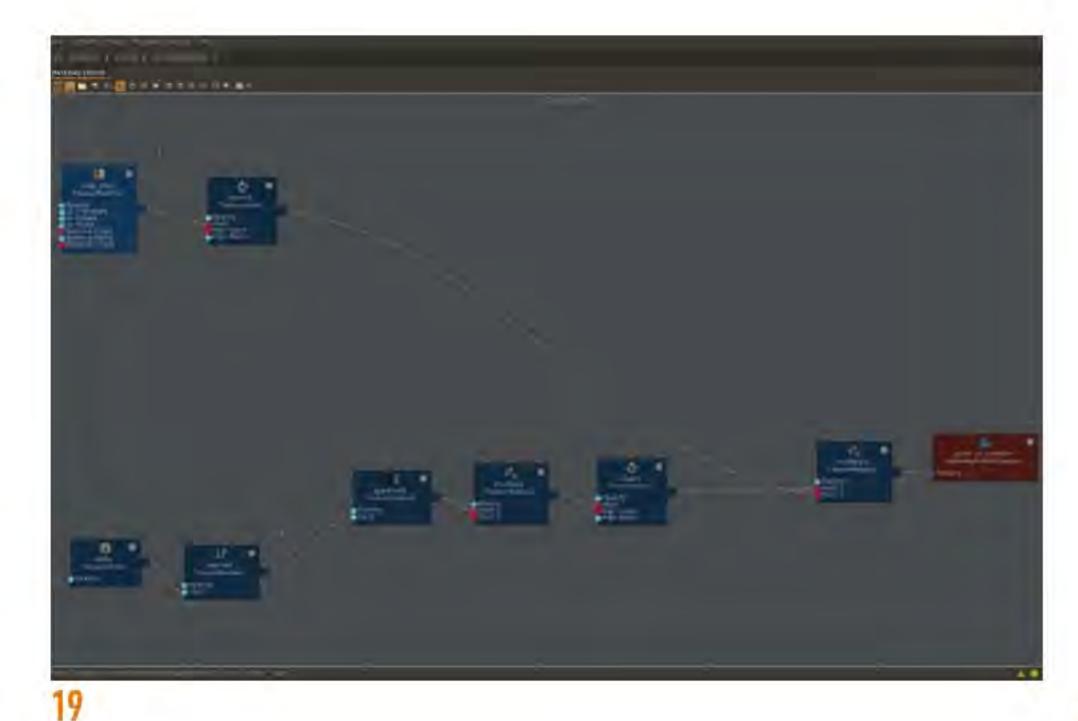
lighting, just using our freshly generated terrain model. This is the point when the benefits of using of real-world elevation data start to become clear. Even without any texture and objects, the pure model still looks natural and grounded. As we can see, reaching this step does not take too much time and we now have a decent-looking and detailed terrain model. Now, using this pipeline, we can download other data sets, align them and then simply re-render.

In this scene I used elevation data from USGS (United States





18





20b

Geological Survey) – they have pretty high-resolution data products, especially for some areas in Alaska. This is the area of the Blue Lake, which is a three-mile long reservoir. With such high resolution and data accuracy it's easy to define the surface of lakes by selecting the areas with a narrow elevation value range. While this is DSM, you may see the shapes of some individual

pines. I exaggerated the heights to

get higher mountains.

17 PROCEDURAL SHADING
We can use satellite images
for the textures, but they usually
don't fit the needs of the production
as they are photographs and have
fixed lighting conditions. In this
Alaska scene I built a shading
network which to some extent
simulates the behaviour of a real
snow cover.

This screenshot is the back end of the original shading network. In the next step you can see the first part, because I baked them to speed up the rendering. It is important for snow to use high albedo like 0.9, even if it looks too bright in the raw render. It doesn't need subsurface scattering at this distance, but high roughness can make it more realistic.

This is the network that generates the pattern of the snow cover. The utility node defines the melting height and there is also a noise procedural texture which adds some turbulent patterns.

One Occlusion node gathers snow to the deeper areas where they build up by the wind, and the other has direction – it's more like the statistical average of the wind

2D or 3D terrain

Only the SDF and scattered metaballs/ spheres create surfaces that reveal the relief on the vertical parts; others can't have surfaces with facing deviation more than 90 degrees relative to the horizontal parts.

direction in this area that makes the wind-exposed areas uncovered.

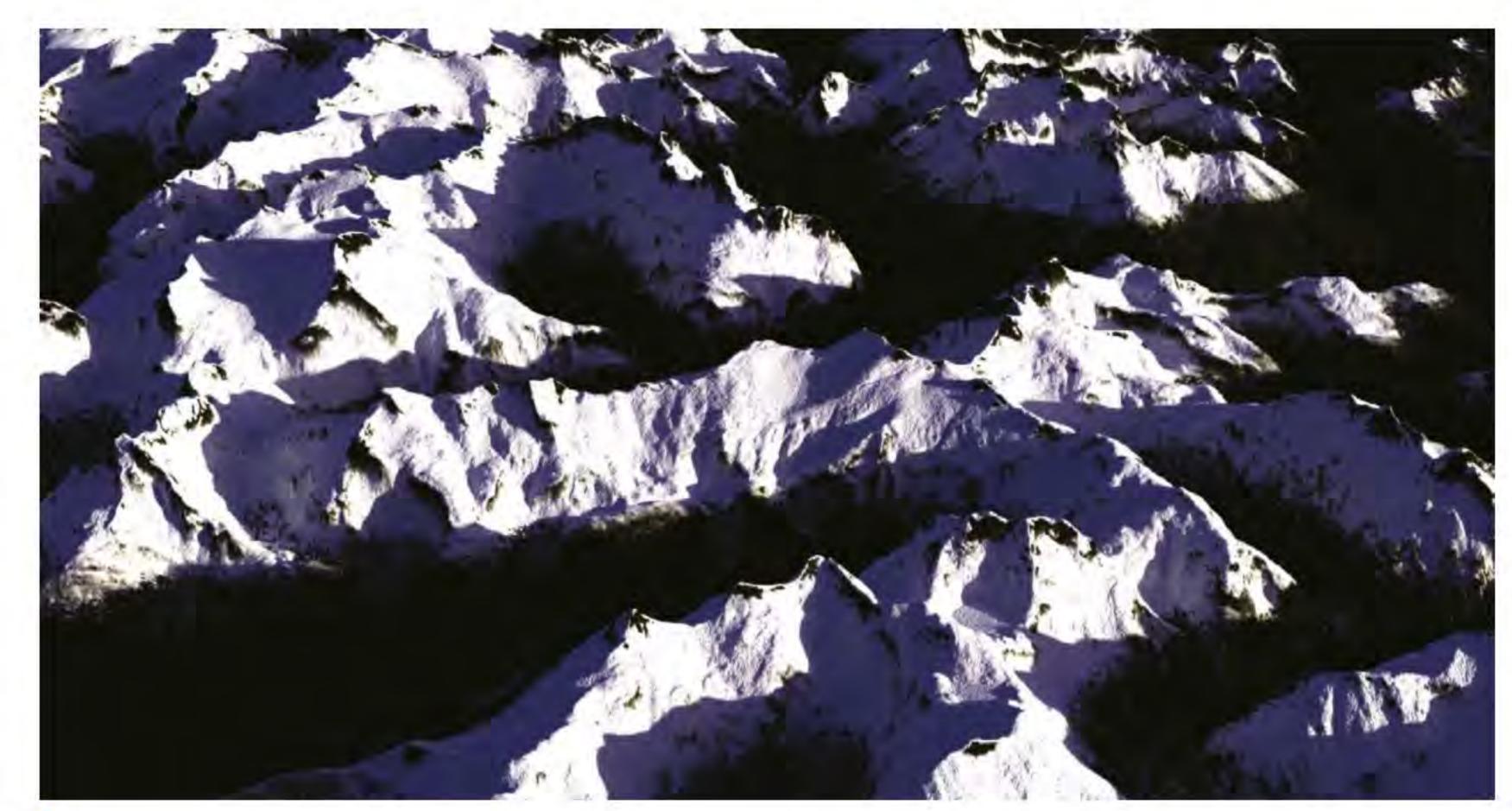
19 FUR FOR DISTANT FOLIAGE

For distant foliage it's not recommended to use detailed tree models, as they tend to flicker even with high sampling settings. Especially for look-dev and concept work, we can use the hair/fur primitives of the renderer. With proper shading they can look like a forest from a bird's eye view, and we can use the same nodes for the scattering as we used for the snow for defining their pattern, which is based on height and slope.

20 ATMOS FX
For scenes of this scale
it's important to include aerial
perspective effects from the
beginning as it significantly affects
the sense of the scale. The fastest
and easiest way is to simply use
the blue-coloured version of the
depth AOV. Additionally we can

put this AOV on top of the image twice, one with a brown/amber tint and Multiply layer mode, the other with a blue tint and Add mode. Of course we can get more realistic results with volumetric objects, but this can often result in far greater render times.

It's important to use real values for light sources and shaders to achieve renders with correct colour and global illumination values. In this image we can see the render without advanced colour management, and using real values can look strange, so it's also recommended to use solutions like ACES, Filmic Blender, SPI-VFX etc. This is a golden hour scene, so I used a dome light for the sky, a distant light with a 0.5-degree spread for the sun, and another distant light with a few degrees of spread, with orange colour to simulate the scattering of the distant clouds around the sun. •



2



3D BASICS

CAMERA LENSES

For the next instalment of our Basics series, let's start exploring the camera

you're new to CGI, you may feel that there are far too many tools to choose from in a dizzying array of software. This series aims to break everything in CGI down to the very basics, so that every artist can be armed with the knowledge of which tool is best. This month we start our look at cameras and lenses.

The camera is probably the single most important tool in the world of CG. It is more important than modelling and animation and if the camera is pointing the wrong way, even the lighting won't be seen. Therefore, mastering how 3D software handles camera manipulation is crucially important.

Over the next few instalments of the Basics series we will look at the various functions of cameras in digital content creation. To start with, let's examine the definition of a camera in CG.

One of the most common assumptions for a new artist working in CG is that the perspective view is the camera. While 'technically' true as the software has created a virtual camera to view the scene in the viewport, this is not the same as an actual camera object.

A camera object is usually identified as a film-style camera wireframe in the viewport, and typically has a properties palette full of information which makes it analogous to real-life cameras.

The most important of these factors is the focal length information, as this determines the zoom or field of view (FOV), and this dictates what the camera is seeing. Learning about focal lengths and how they can be

used for scene manipulation is incredibly important for making shots believable in terms of scale, and once this has been mastered it can become a great tool for manipulating images for more fantastical briefs.

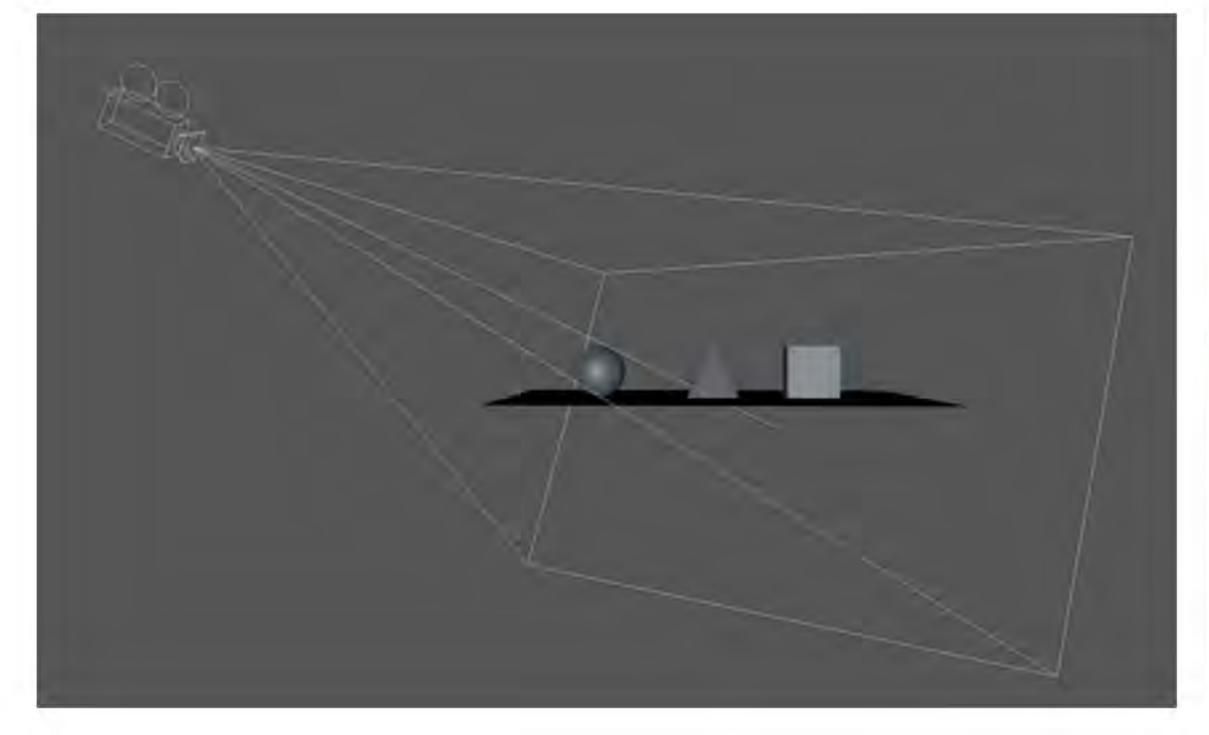
Most CG cameras default at a focal length of around 35mm, which is a very common focal length for cameras as a 'do all' solution. However, if the scene is of a portrait of a CG head bust for example, then a 80-100mm focal length would be more suited, as the longer a focal length the less perspective distortion occurs, making the bust look more realistic.

Naturally the best way to learn about focal lengths is to use an actual camera, and this knowledge will easily transfer to your CG projects.



Mike Griggs Mike Griggs is a 3D and visual effects artist with vast experience across the industry, as both a creator and a technical writer. www.creativebloke.com





VIEWPORT CAMERA

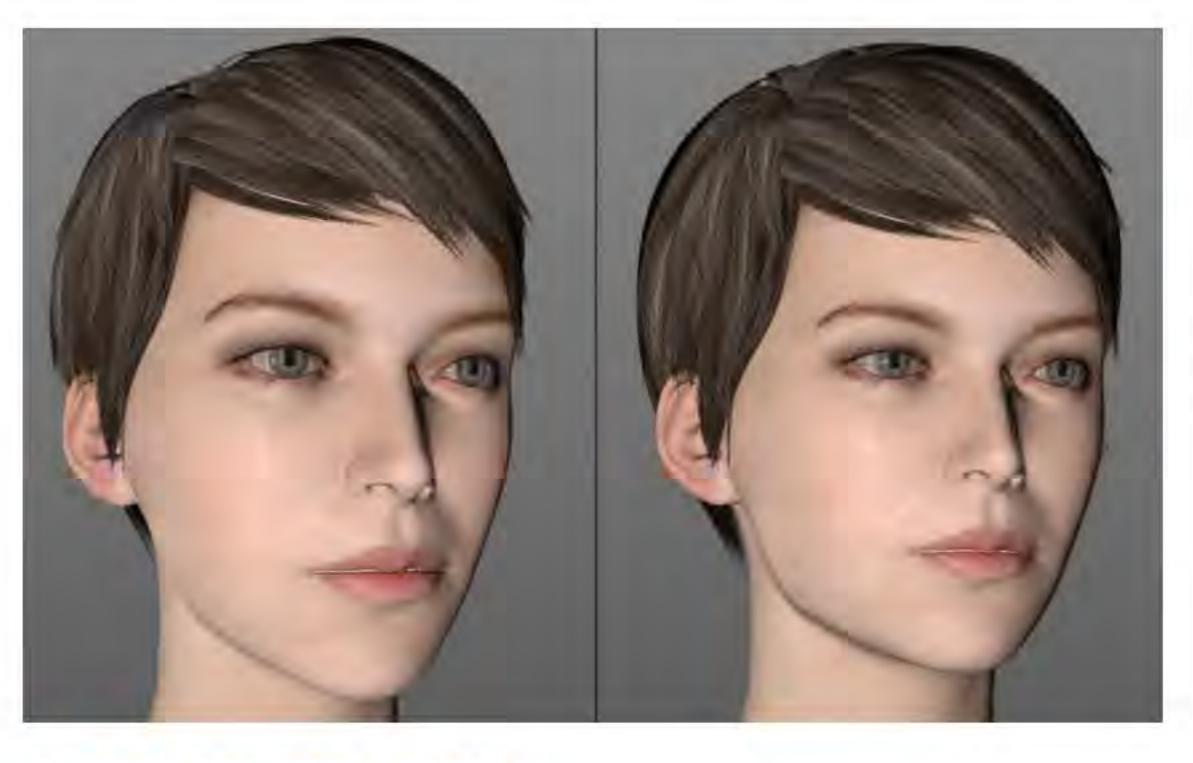
Although most digital content creation applications allow rendering in any viewport, this is not the same as having an actual camera object. A camera object usually has a lot more options for controlling focal length, and as it is an actual 'object' in the scene it makes animating it a lot easier. Some applications allow the default front, top and side cameras to actually be seen and exported, but be mindful of these as usually they are best kept hidden.

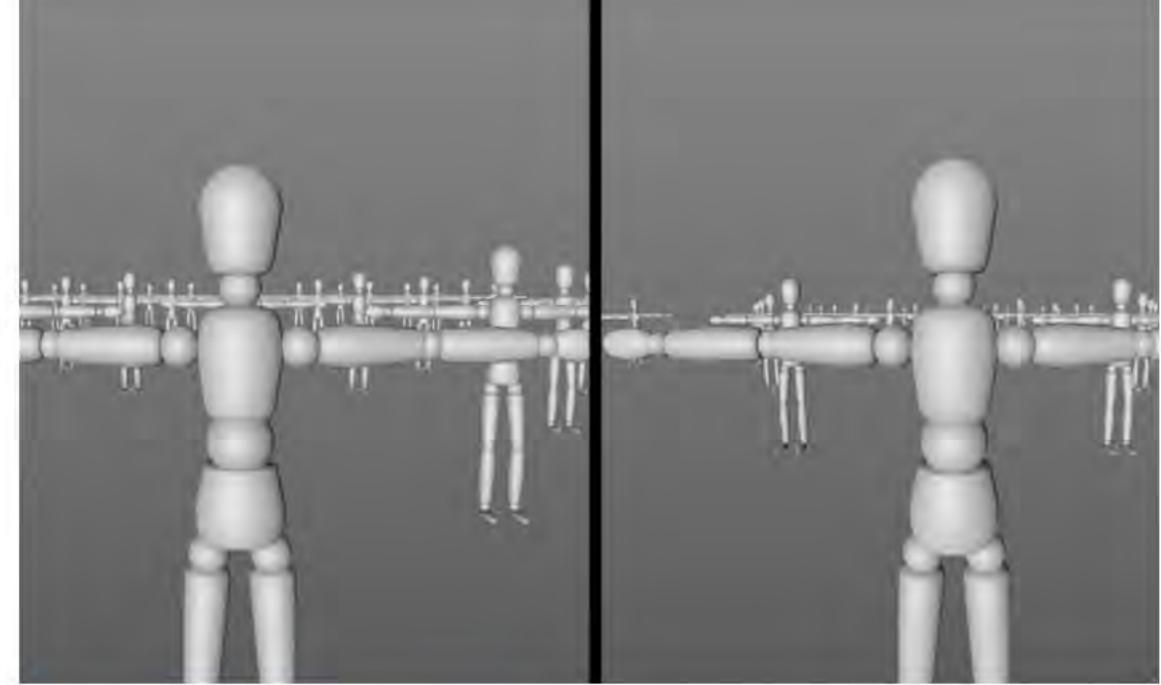
WIDE-ANGLE LENSES

Wide-angle lenses (which tend to be classed as anything lower than 35mm) are good for wider scenes as they can catch a lot more detail. They are not great for close-up work as they distort features, so are unflattering for character work. Extreme wide-angle lenses are common in architectural work, but be mindful to straighten vertical lines; this effect can be achieved with tilt-zoom lenses, commonly used in high-end architectural photography, but can be re-created easily in software.



Not all digital content creation software comes with an easily recognisable camera object. A good example is ZBrush however, the focal length can be adjusted in the main view to create more compelling renders. Also, files can be exported with camera data into formats such as Alembic and FBX, which can be imported into a wide range of applications to ensure that the camera view when using a painting application such as Substance Painter matches up with the original scene.





TELEPHOTO LENSES

Lenses that are longer than 50mm tend to be called telephoto lenses and are commonly used for character and close-up work, but they also tend to be used for macro work. Most portrait work is done in the 80-100mm range.

Additionally, long telephoto lenses in the 150-200mm range can be great for certain types of scenes as they can be used to create interesting contrasts between the foreground and background.

USING ZOOM LENSES

Zoom lenses are often seen as the 'poor cousins' of prime lenses which have a single focal length, but good use of zoom lenses in a scene can be a great way of achieving some creative effects and looks. The ground-breaking spaceship work in the TV reboot of Battlestar Galactica depended on zoom lenses, and they can be used to create a dolly zoom effect – a technique in which there is an object in the centre of the screen while the background appears to zoom in or out. •



OCTANE RENDER

One of the pioneers of GPU rendering, OctaneRender is a highly regarded, physically accurate render engine for all major platforms

rendering was barely touched by a wide range of render engines. This was because an unbiased render solution was computationally intensive and therefore very slow. This was a great shame, as from a user's perspective an unbiased rendering solution offered 'true' physical lighting exactly as would be seen by the naked eye or the lens of a camera.

OctaneRender from OTOY was one of the pioneers of moving the computationally intensive tasks of unbiased rendering over to the Graphics Processing Unit (GPU, otherwise known as the graphics card), which is able to divide tasks across a much greater number of parallel cores. By using GPUs, all of a sudden unbiased renders could be achieved in minutes on a single machine instead of hours or days as was the norm before using CPU rendering.

As OctaneRender gets ready for a milestone version 4 release, it has become one of the leading render engines on the market. This is primarily due to the large number of software solutions that OctaneRender can integrate into through the wide selection of plugins that are available for digital content creation applications, including 3ds Max, Maya, Cinema 4D, Houdini, Modo and LightWave to name but a few. OctaneRender is available for CAD applications and also

Nuke, allowing compositors to work with OctaneRender without needing to round-trip to an application. A lot of this flexibility is handled in the background by the ORBX format which OTOY uses as the underpinnings of its standalone application, and makes transferring scenes between applications easier than it would be with other render solutions.

OctaneRender also has one of the most responsive render preview systems, making iterative changes easy to visualise in near real time. As OctaneRender is an unbiased solution, it is easy for artists new to 3D to learn with OctaneRender materials, lighting and cameras all corresponding to real-world settings.

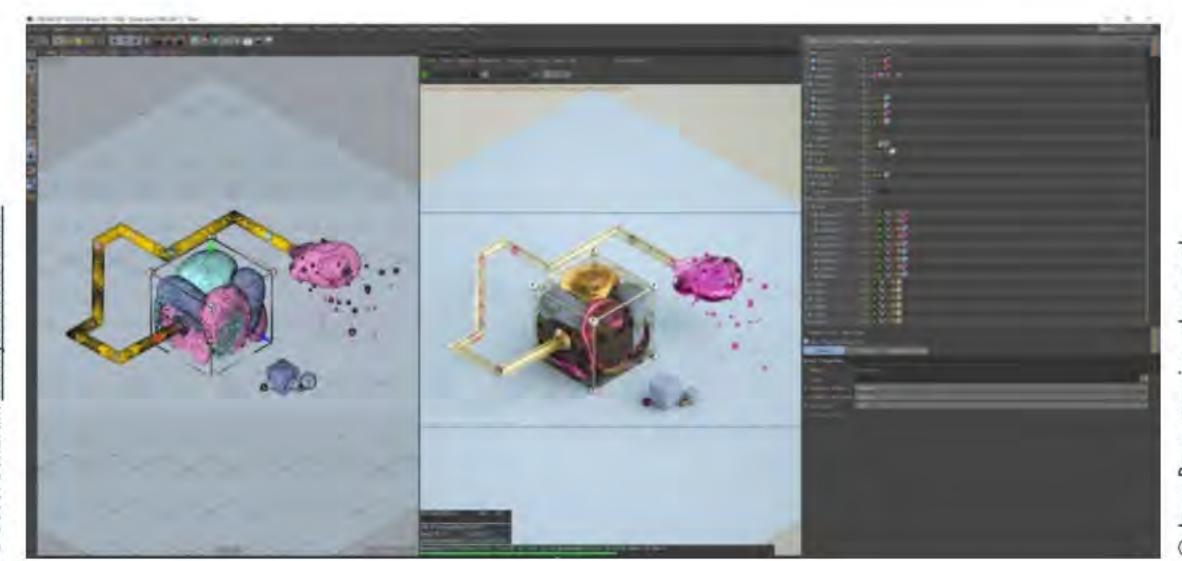


Mike Griggs is a 3D and visual effects artist with vast experience across the industry, as both a creator and a technical writer.

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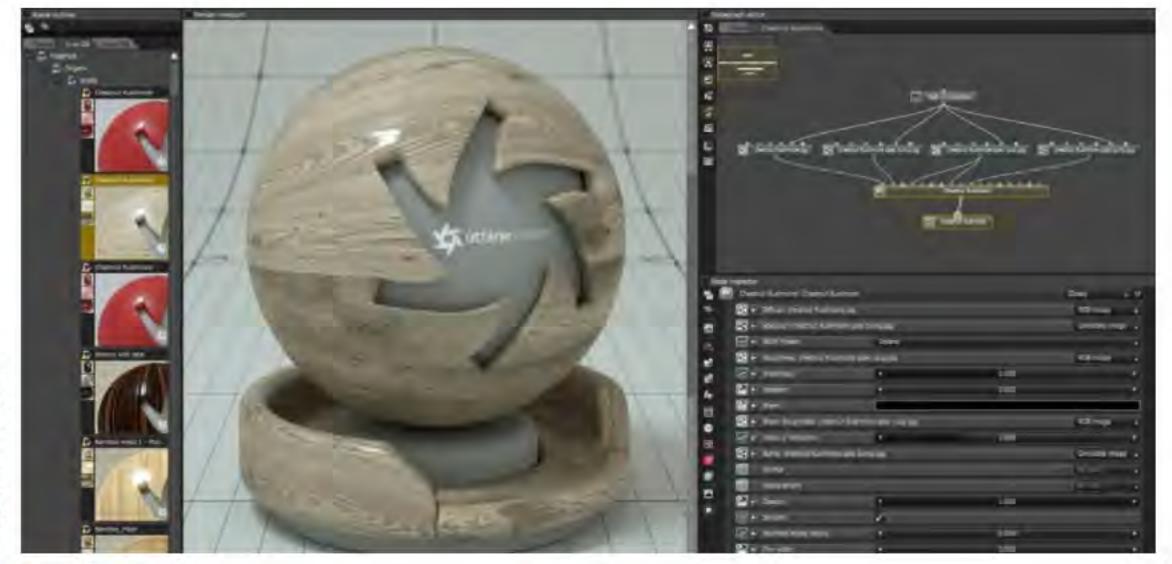
1 STANDALONE APPLICATION

Unlike many other third-party render solutions, OctaneRender comes with its own standalone application. This may initially seem odd, as so much time is spent in the host application with the chosen OctaneRender plugin. However, having a standalone application is a really useful tool because it allows a wide range of elements to be tested as scenes are moved between different creation applications.

? RENDER PREVIEW

OctaneRender has one of the most impressive render preview windows in the Digital Content space. Not only is it exceptionally responsive in comparison to other GPU render solutions, OctaneRender allows – dependant on the plugin – quick access to material selection, focus point selection and AOV/render layer preview. Support is being implemented for Apple Metal allowing Mac users to bring OctaneRender into their workflows.



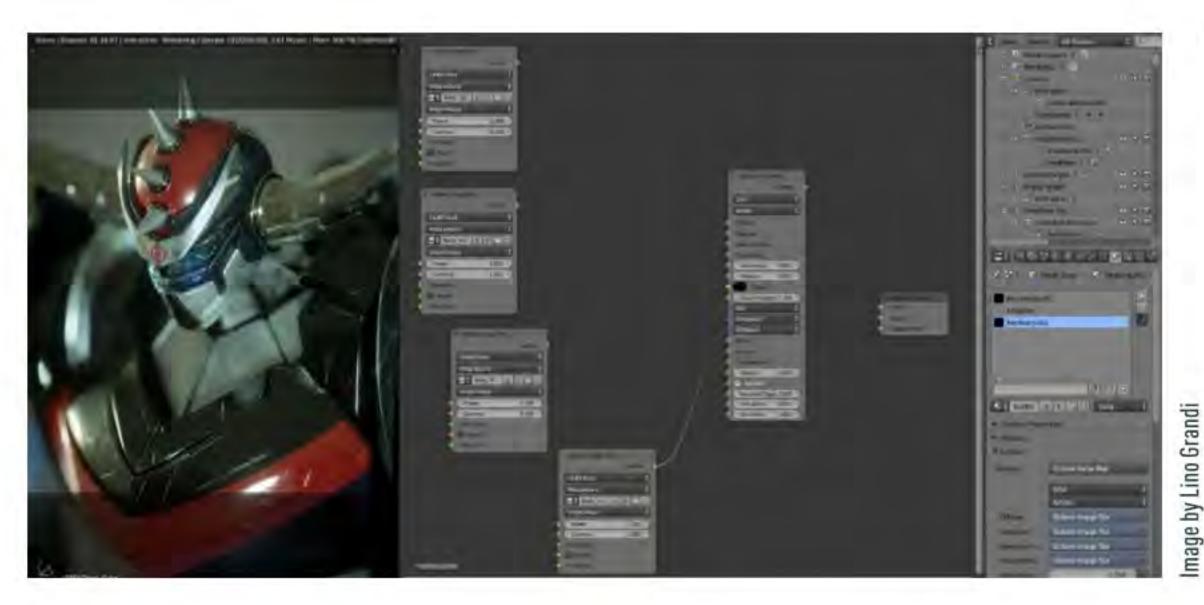


POR COMPOSITORS

OctaneRender is friendly for compositors as it is available as a plugin for the compositing application Nuke which supports deep pixel rendering, allowing Nuke artists to have access to the latest compositing toolsets combined with the speed of GPU rendering. As OctaneRender also supports features such as volumetric rendering, it is an excellent solution for effects work where dust, smoke or flames are often required.

MATERIAL LIBRARY

OctaneRender comes with an array of materials, constantly added to by the community, and are easily accessed in host applications through the OctaneRender LiveDB. As OctaneRender is an unbiased render engine, materials have a logic to them that is easier to grasp for new 3D artists than those of a biased render engine. OctaneRender also supports a full material baking paradigm, making it an excellent tool for those working in real-time creation.





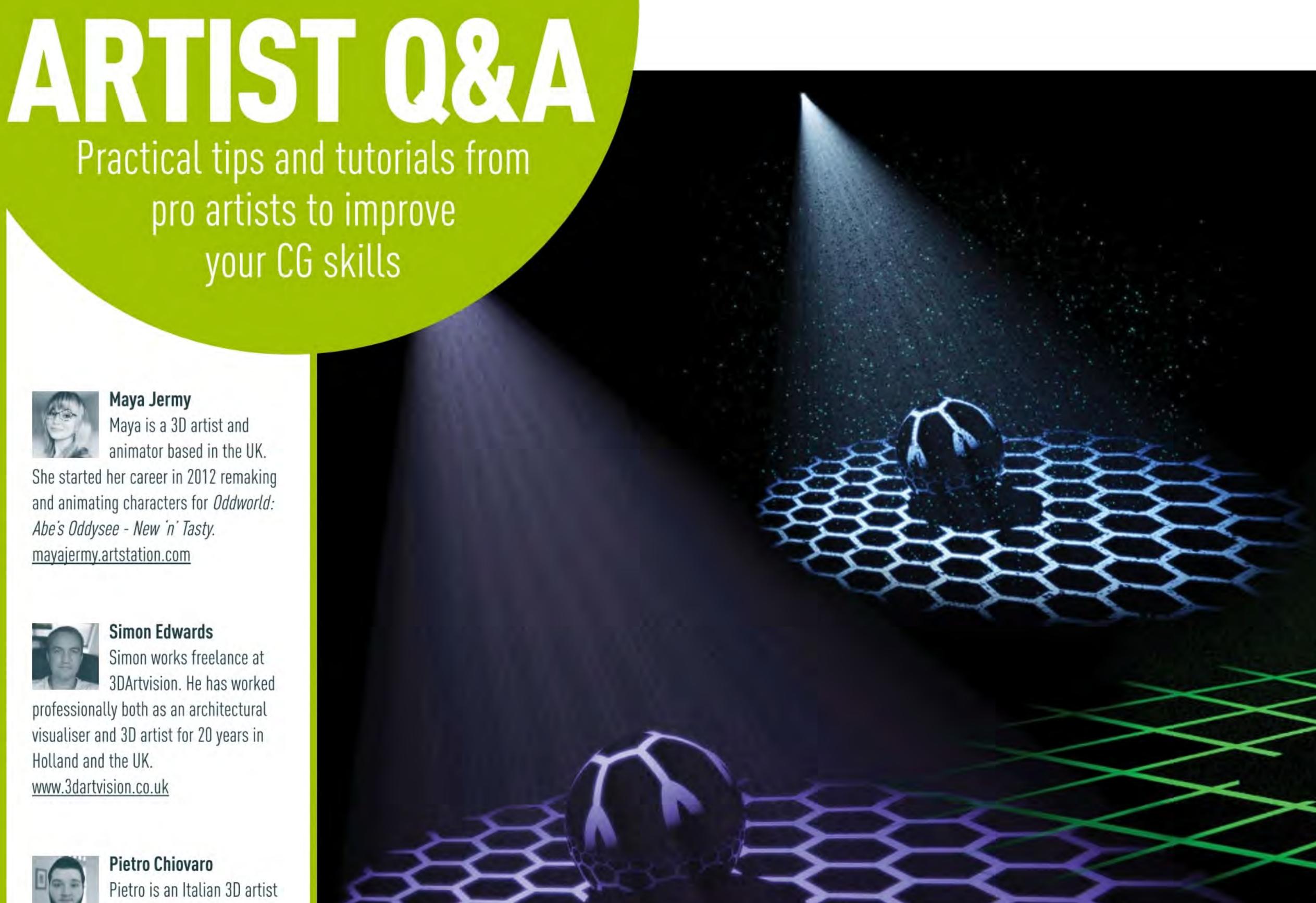
OCTANERENDER 4

The new release is already available as a beta to existing customers. Major highlights are the integration of OTOY's real-time path-tracing engine, Brigade, into OctaneRender. There is also the addition of a Spectral AI Denoiser and AI Light system that will enable cleaner animations and dramatically faster render times, improved fog and a new planetary environment. OctaneRender 3 full-licence customers will get a free upgrade to the new version.

NODES IN OCTANERENDER

Nodal workflows are key to the power of OctaneRender.

Nodes are used to control practically every aspect of the application in the standalone version and they are also used through the OctaneRender plugin environments for materials. For artists new to nodal workflows – although potentially confusing at first – they can offer great efficiencies especially when using texture files and gradients that need only one node to control multiple outputs.





who creates 3D assets and

environments, and is currently working on an open-source game.

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Antony Ward

Since the early 90s Antony has worked for many of

today's top game and VFX studios, as well as written three technical manuals and many online tutorials.

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EMAIL YOUR QUESTIONS TO rob.redman@futurenet.com

HOW DO I ACHIEVE LIGHT SCATTERING IN KEYSHOT 8?

Greg Radcliffe, Bristol

SOFTWARE: KEYSHOT 8



Maya Jermy replies

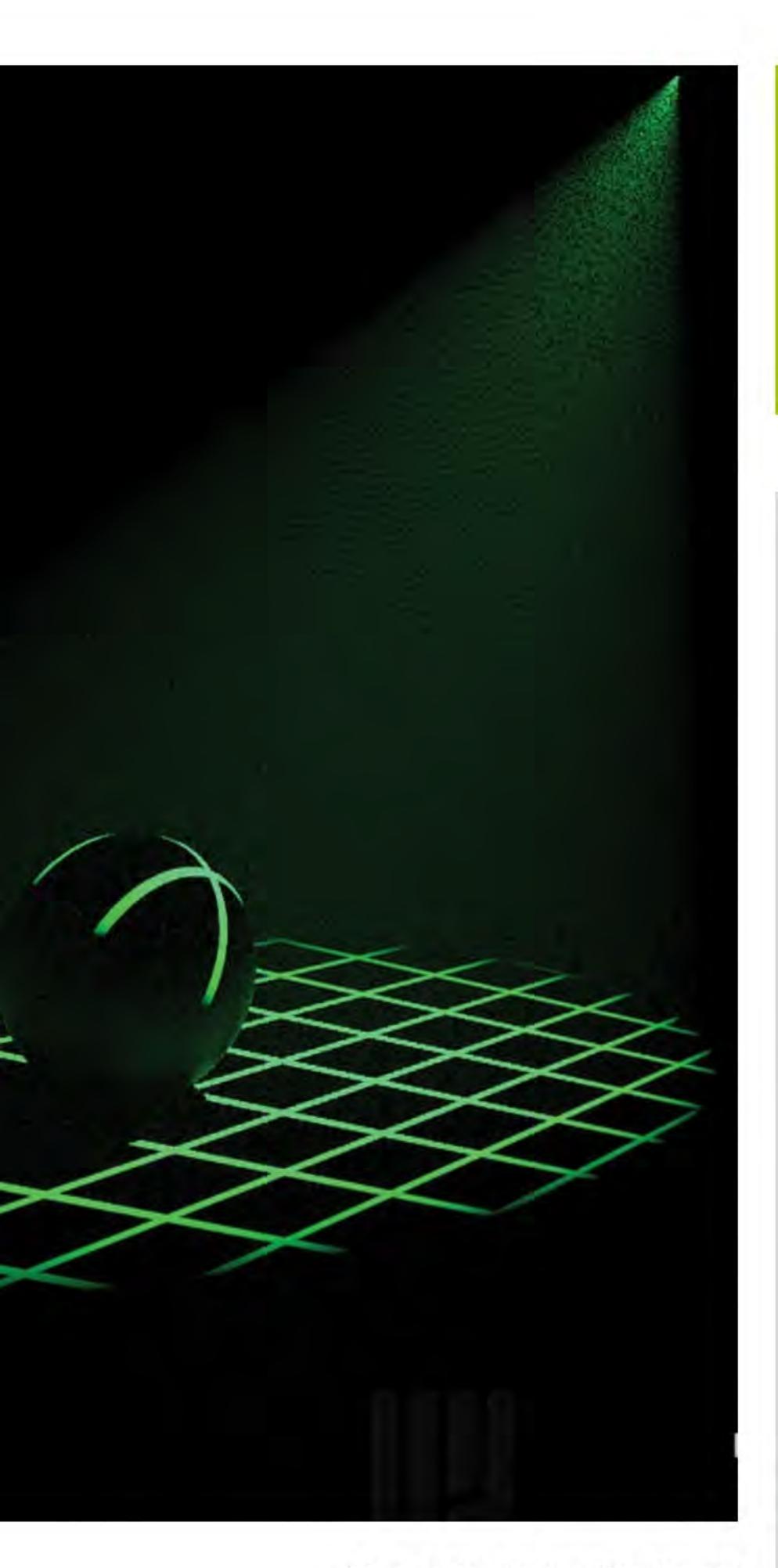
We are lucky to be living in a time when technological

innovations enable us to create and control stunningly realistic-looking graphics. We are at the point where it is becoming impossible to tell if some images are a real photograph or just a clever use of 3D and ever-progressing render applications. Advancing visual simulations enhance the user as well as audience experience, whether it is a film, game or any kind of digital art. As an audience we do not get easily fooled, because even if we cannot quite explain what is wrong with the image we are looking at, we know that something

is not quite right. This may soon become a thing of the past as companies are racing to develop the best applications allowing hyper-realistic graphics.

KeyShot 8 introduces a lot of exciting features and solutions to help simulate even more believable renders. One of those new features is a brand-new material type called Scattering Medium.

Scattering Medium is responsible for particle scattering and enables artists to create realistic-looking effects like fog, smoke or even rays of light. There are several materials in that group which imitate things like sponge or clouds.



Get ready to transform your 3D environment with a few simple steps

There is much to choose from and there are options available for adjusting the materials to our needs. So, if for example we want to create a beautiful theatrical stage with light beams shining down and cutting through some smoke or low-lying fog, we will use the Scattering Medium to fake such effect. Without the scattering light particles, we will not be able to see the actual beam of light, only the lit-up area the light particles bounce off.

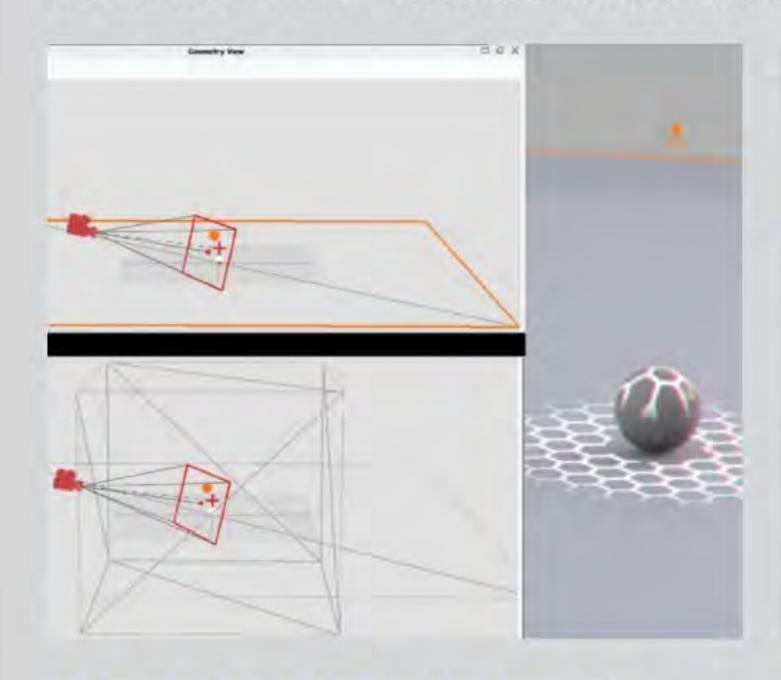
Here I demonstrate how to work with the Scattering Medium in KeyShot 8. This basic method will help kickstart some dramatic changes in any scene.

EXPERT TIP

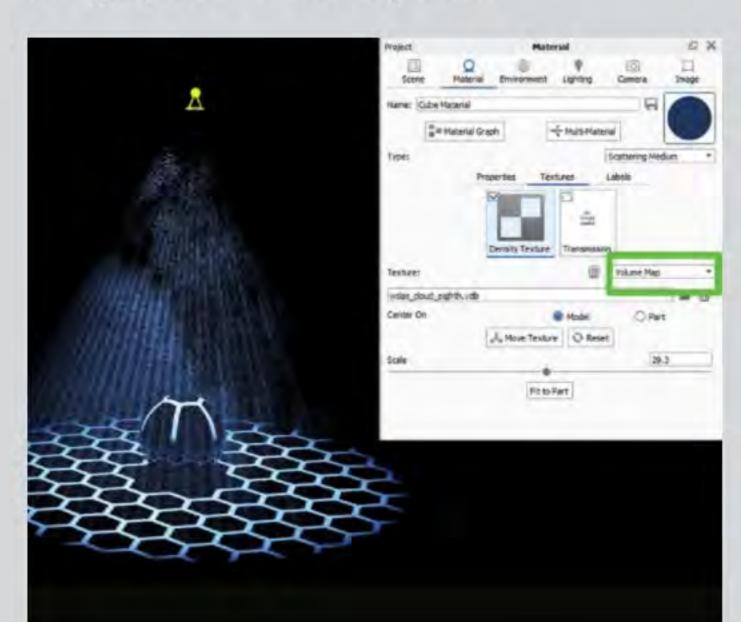
IMAGE EDITOR

When you hit the Render button and the Render window pops up, you will find the 'Show Image Styles Panel' button in the top left. If you add Bloom and Chromatic Aberration in the render viewport, KeyShot will also add those changes to the active viewport. This way you can see how it will look without having to render an image.

STEP BY STEP CREATE LIGHT EFFECTS WITH SCATTERING MEDIUM

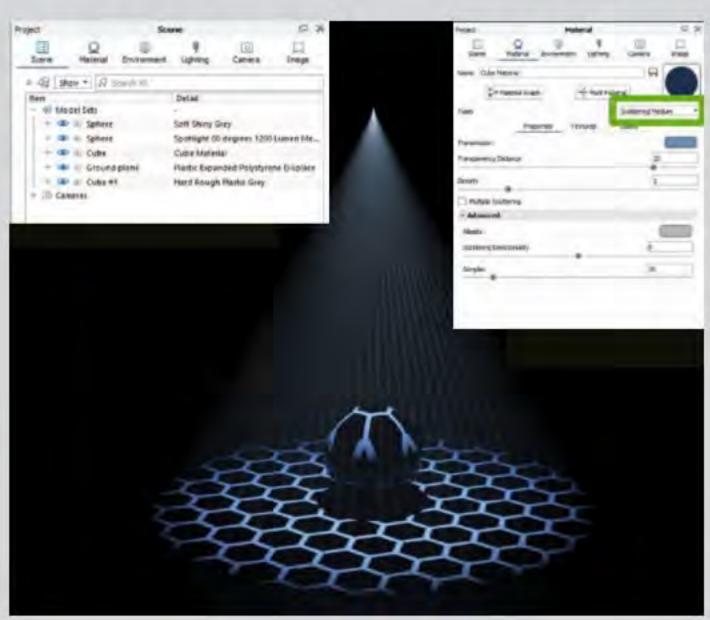


PREPARE THE GEOMETRY
For this scene, create a sphere
serving as an object to illuminate. Apply
a Soft Shiny Grey material. Add another
smaller sphere as the source of light
and position it above the big sphere.
Create a ground plane and apply a Plastic
Expanded Polystyrene Displace material.
Add a box and scale it up to cover the
entire scene. Press O on the keyboard to
bring up the Geometry view.

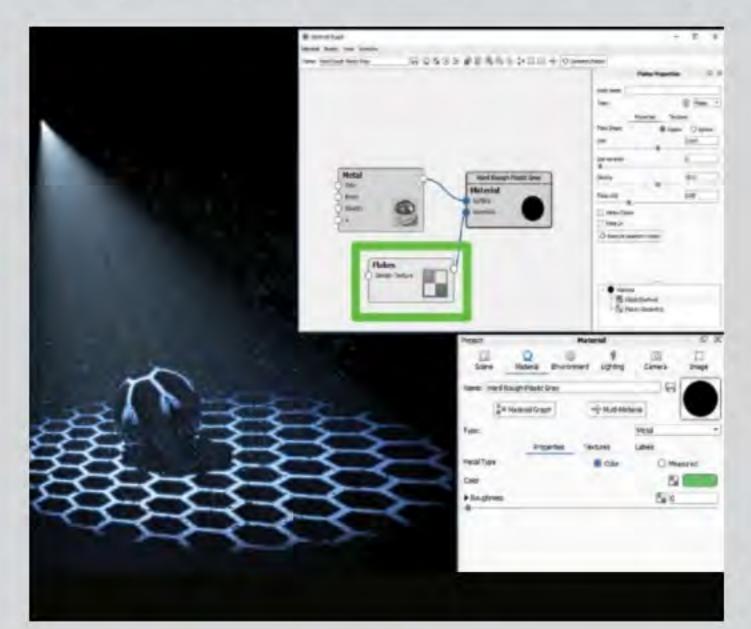


The next step is to fake a realistic-looking fog or smoke effect. Make sure you have the cube material selected and in the Material menu navigate to the Textures section.

Select the Density Texture slot and from the drop-down menu choose the Volume Map option. Choose a VDB map and then move the texture to the right position.



Apply your choice of spotlight material to the small sphere and adjust its Power. If you want to simulate the gobo effect, choose a spotlight with a light-controlling stencil. Apply the black environment HDRI to the background for better contrast. Double-click on the box to open the Material tab and in the Type menu select Scattering Medium. Up the Transparency Distance and lower Density.



To create flakes or dust, add a new geo to the scene, for example a cube. Scale it up to cover most of the lit-up part of the scene. Apply a material to it, in this instance Metal. Open the Material Graph and right-click to bring out the node ribbon. From the options select Geometry>Flakes. Double-click on the

Flakes node to see its edit menu. Adjust

the Size and Density sliders to your liking.





WHAT IS A QUICK METHOD FOR BUILDING A SIMPLE CANDLE FLAME?

Tom Butler, Leicester



Simon Edwards replies

Creating realistic-looking CG fire might seem like a

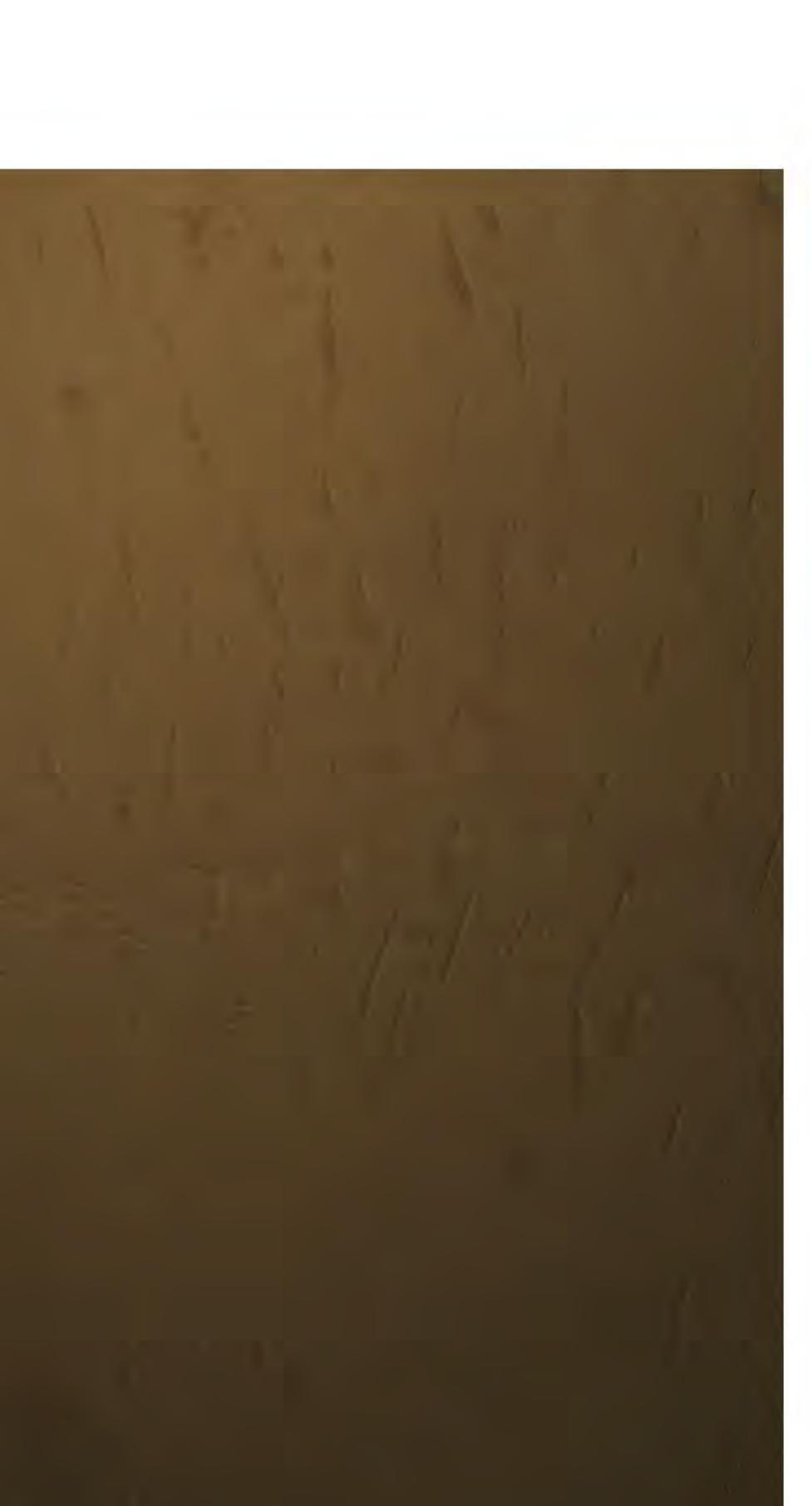
daunting task, and generally speaking I would always advise utilising a simulation plugin, such as the water and fire simulator Phoenix FD supplied by Chaos Group, for this sort of task.

In fact, for anything more complex than the simplest of flames, I don't think there are many other options available other than using a simulation plugin program such as this. However, this might seem like an awful lot of fiddly work for something small and simple in a scene, such as a small flame from a candle. So with that in mind, here is a quick and easy method of modelling and texturing a pretty convincing candle flame.

The candle itself in this scene began life as a simple cylinder in 3ds Max. It was then exported as an OBJ file, then deformed inside ZBrush to add all the lumps, bumps, dents and bends for a more realistic-looking candle shape.

It was then imported back into 3ds
Max where I applied a VRayFastSSS2
(subsurface scatter) texture to give it that
soft, semi-opaque, waxy look. Funnily
enough, I find that the Potato preset in
VRay's SSS texture works well as a candle!

The scene was then illuminated using only a single light source positioned just above the flame, and for this I have used an invisible V-Ray spherical light multiplied to a high setting of 800 and with an orangey yellow colour.

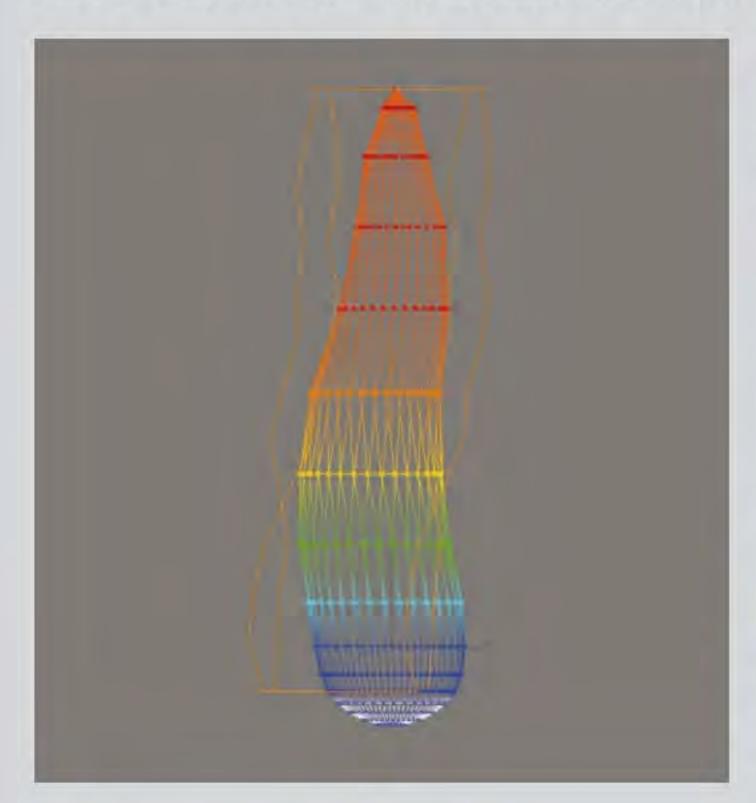


For a small, single flame simulation such as this, we can use a V-Ray spherical light

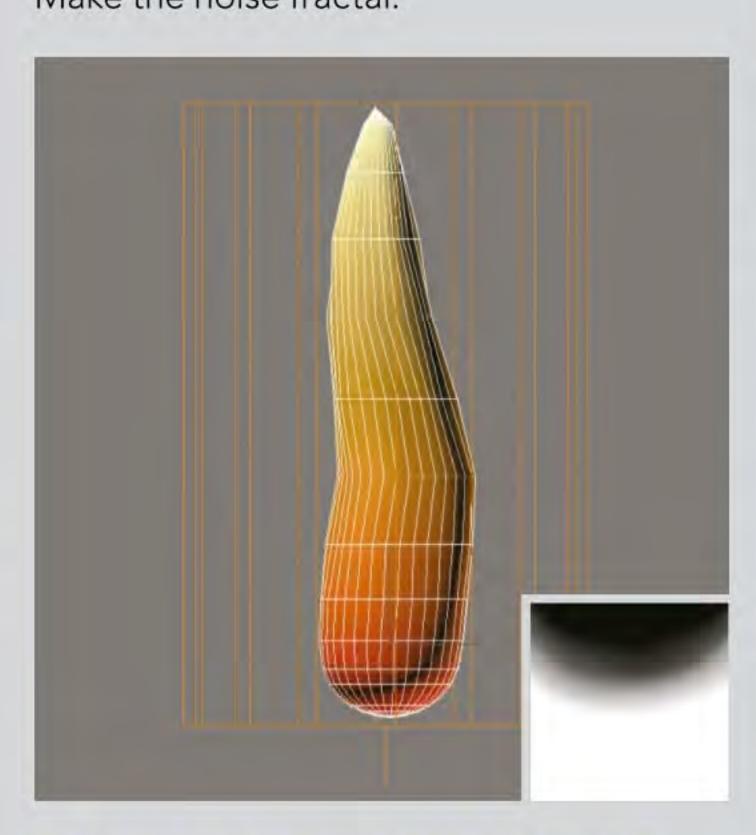
EXPERT TIP BEND MODIFIER

To create even more realism apply an additional 'bend' modifier to the flame while selecting the very top vertexes and with Soft Selection switched on. fashion as described in step 2.

STEP BY STEP MAKE A CANDLE FLAME WITH 3DS MAX AND V-RAY



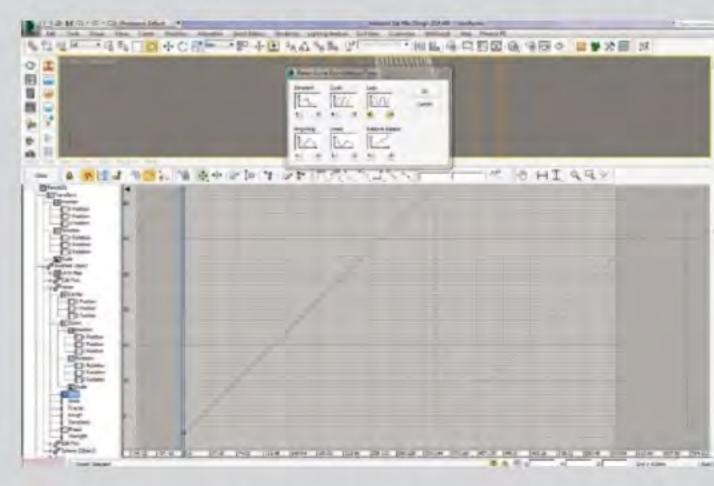
Create a simple sphere with around 32 segments. Apply an Edit Poly modifier. Switch on Soft Selection and grab the top few vertexes. Drag them up vertically until you have an elliptical, flame-shaped form. With the vertexes still selected add a noise modifier and adjust the x and y strengths a little to deform the flame. Make the noise fractal.



Add a Cylindrical UVW map to the flame object. Create a new V-Ray material in the editor and switch on Compensate Camera Exposure in the Self-illumination parameters. Add a gradient ramp to the Self-illumination slot.

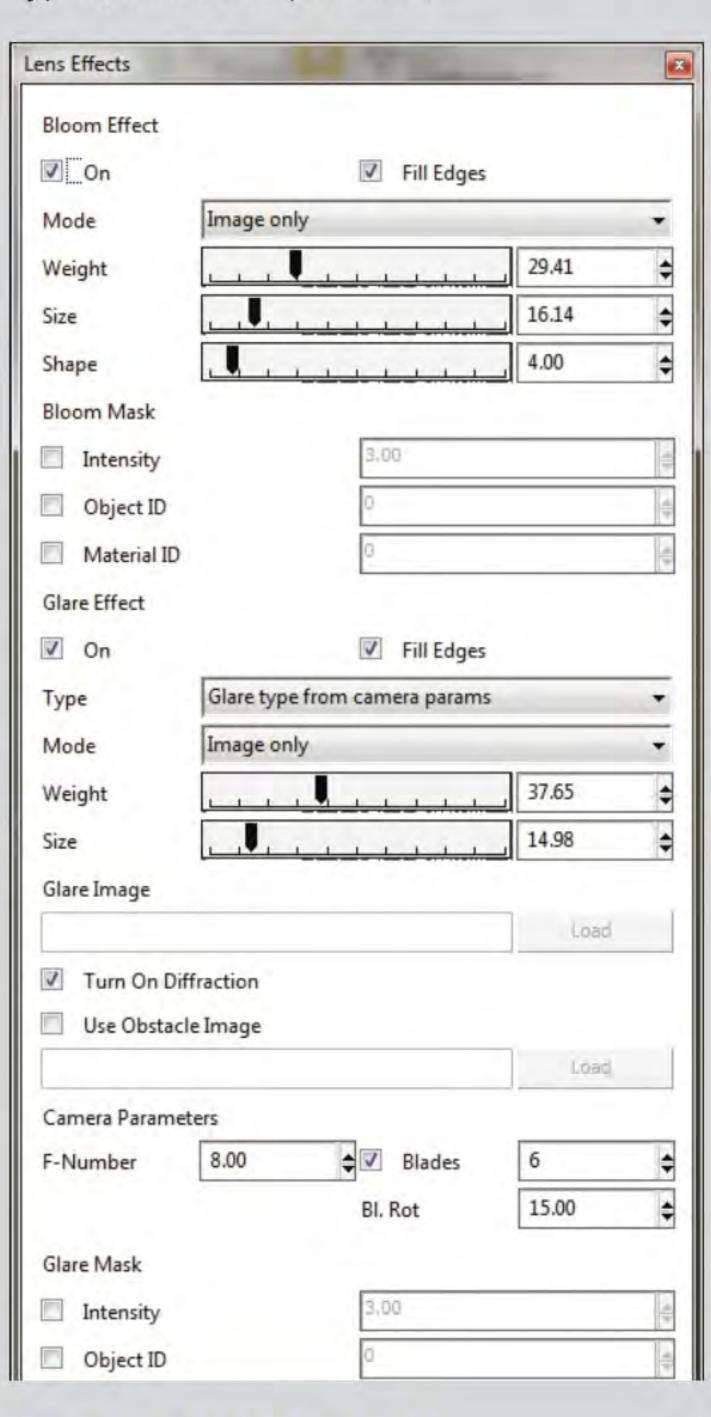
Colour the gradient from an orange red, through yellow to white and make the gradient type and interpolation both 'linear'. Switch up the Self-illumination level to around 1,000. Apply the material to the flame.

Next you need to create a simple black and white opacity map in Photoshop (such as in the image) and then add it to the opacity slot.



Switch on Set Key, amongst the animation parameters at the bottom of the screen, and then press the key button at frame 0. Slide the time bar along a few frames, adjust the x and y strength parameters in the noise modifier and press the key button again. Continue doing this five or six times along the time bar.

Open the Curve Editor, select the modified noise parameters in the flame objects list, click on Curve Out-of-Range Types, select Loop and OK.

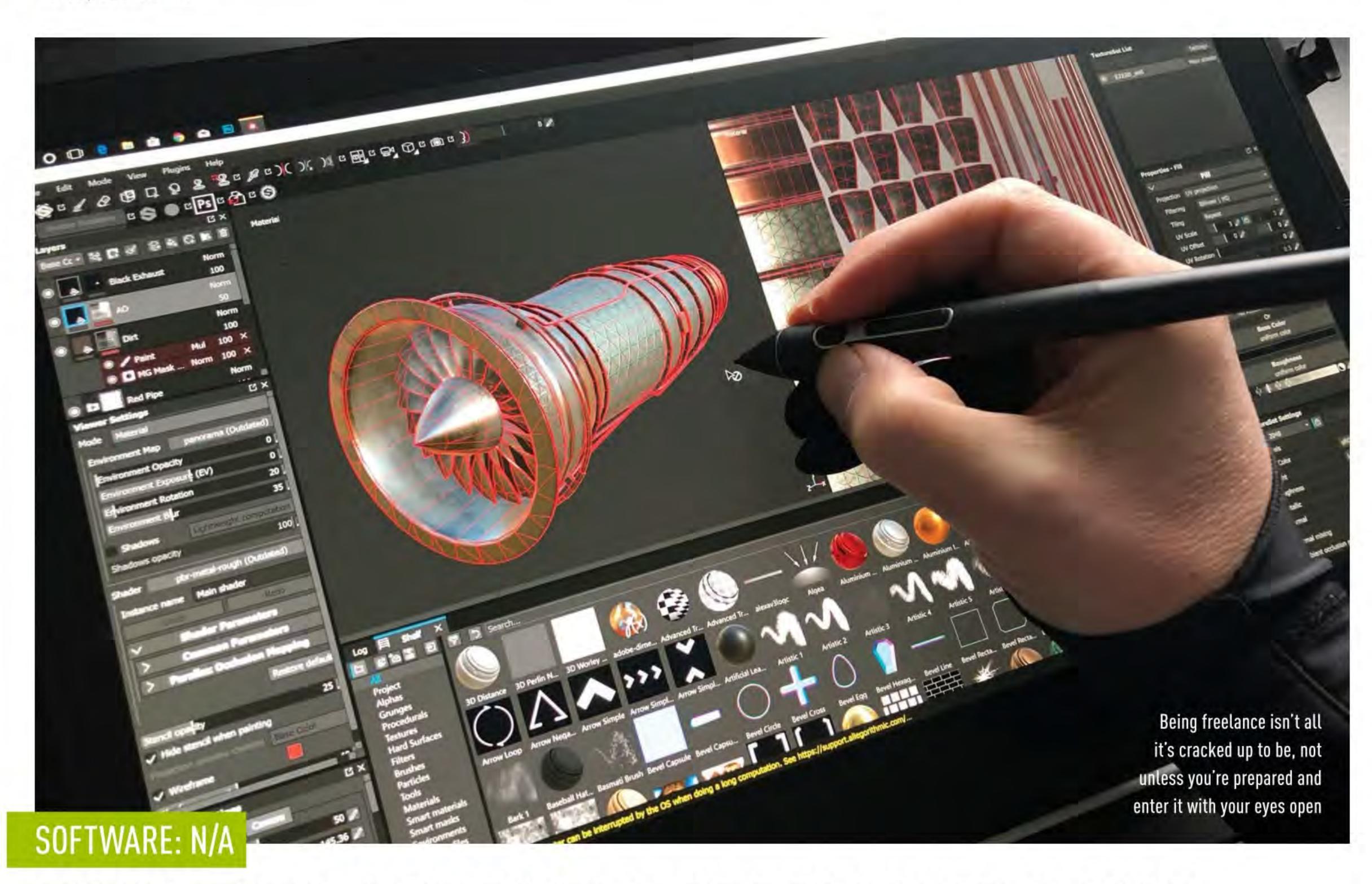


In the V-Ray Frame Buffer click on the Lens Effects button at the bottom of the dialog box and switch on both Bloom Effect and Glare Effect.

Render the image and then you can interactively adjust the size and weight of both until you are satisfied.

Then animate this modifier in the same





I WANT TO BECOME A FREELANCE GAME ARTIST – DO YOU HAVE ANY ADVICE?

Geraldine Swordy, France

Antony Ward replies

From the outside the freelance life looks ideal. You can pick and choose your projects, organise your own hours, and you get to work from home in your pyjamas if you so choose to. Unfortunately, however, if you're not organised or properly prepared, it can actually be a bit of a nightmare.

You are now fully in charge of what you earn, so imagine the pressure if you have bills to pay but no work coming in, and securing those all-important contracts isn't as easy as it sounds. You are up against some stiff competition, not only from other artists, but artists who may do the same work but at a much lower rate.

So, how can you put your name at the top of a company's outsource list?

First, I would suggest you get some industry experience. Go and work in a studio, or even a few studios so you get to know how they work in real life. Not only this, but you will also gain a greater understanding of the pipeline and

workflows, meaning that once you are freelance, a potential client will have more confidence in your skills because you have the experience to back them up.

In addition to this, over time you will make many friends and acquaintances who, in the future, could become regular clients. Another key part of being freelance is that it's as much about who you know, not just what you know.

I would also try and gain some experience in multiple areas, so as well as modelling perhaps you can also animate and even rig characters. Not only does

this, again, make you more valuable to clients, but it also means that you have more avenues to explore when looking for contracts.

Finally, I would suggest you make sure that before you take the leap your portfolio sparkles, not only with polished renders but progress shots to show how you work. When it comes to game development it's not just the final product that needs to look good, how it's built is just as important – so don't be afraid to share the wireframe and texture pages to show off your topology and UVing skills.

EXPERT TIP

WORK ON YOUR SOCIAL PRESENCE

An online presence is also essential when working as a freelancer, so keep your social media streams active with updates on your work and what you're doing. You never know, a future client could be watching.



SOFTWARE: SUBSTANCE DESIGNER

HOW CAN I CREATE A MEDIEVAL CONCRETE MATERIAL USING SUBSTANCE DESIGNER?

Sophie Boiko, Düsseldorf



Pietro Chiovaro replies

I will show you a really simple process for the creation of a

basic medieval concrete material using Substance Designer. For this type of substance, I selected the Physically Based (Metallic/Roughness) Graph Template and deleted the Metallic output since it isn't necessary for this substance.

After this step we can start to add the nodes useful for the creation of the concrete, so from the Substance Designer library we need: the Fractal Sum 1 and the BnW Spots 1 noises (these are the main elements of the concrete material), the Height to Normal World Units filter, two Levels filters, a Blend filter and the Gradient Map filter.

Now it's time to link all of these elements together. First of all, we need to link the Fractal Sum 1 noises to the Foreground and Opacity inputs of the Blend filter, then we have to link the BnW Spots 1 to the Background input of this filter. Now we have to link the Blend

filter to the Gradient Map that will be connected to the Base Color output of the material. At this point, we have to link the BnW Spots 1 noises to the first Levels filter, and consequently this filter must be connected to the Roughness output of the material. At this time, we have to link the Blend filter to the second Levels filter and consequently link the element to the Height output. At the end of this step we need to link the Blend filter to the Height to Normal World Units filter. This one must be connected to the input of the Normal output.

Now it's time to set the parameters of this material. For the first Levels filter (the one linked to the Roughness output) I decrease the high tones in order to lessen the reflection on the concrete. For the second Levels filter I increased the high tones in order to give a low rough effect to the material. In the Height to Normal World Units filter I set a value of 1,000cm for the Surface Size and 7cm for the Height Depth.

Lastly, in the Gradient Map I created a shade of yellow and rose in order to give colour to the final substance.

EXPERT TIP

HEIGHT TO NORMAL WORLD UNITS FILTER

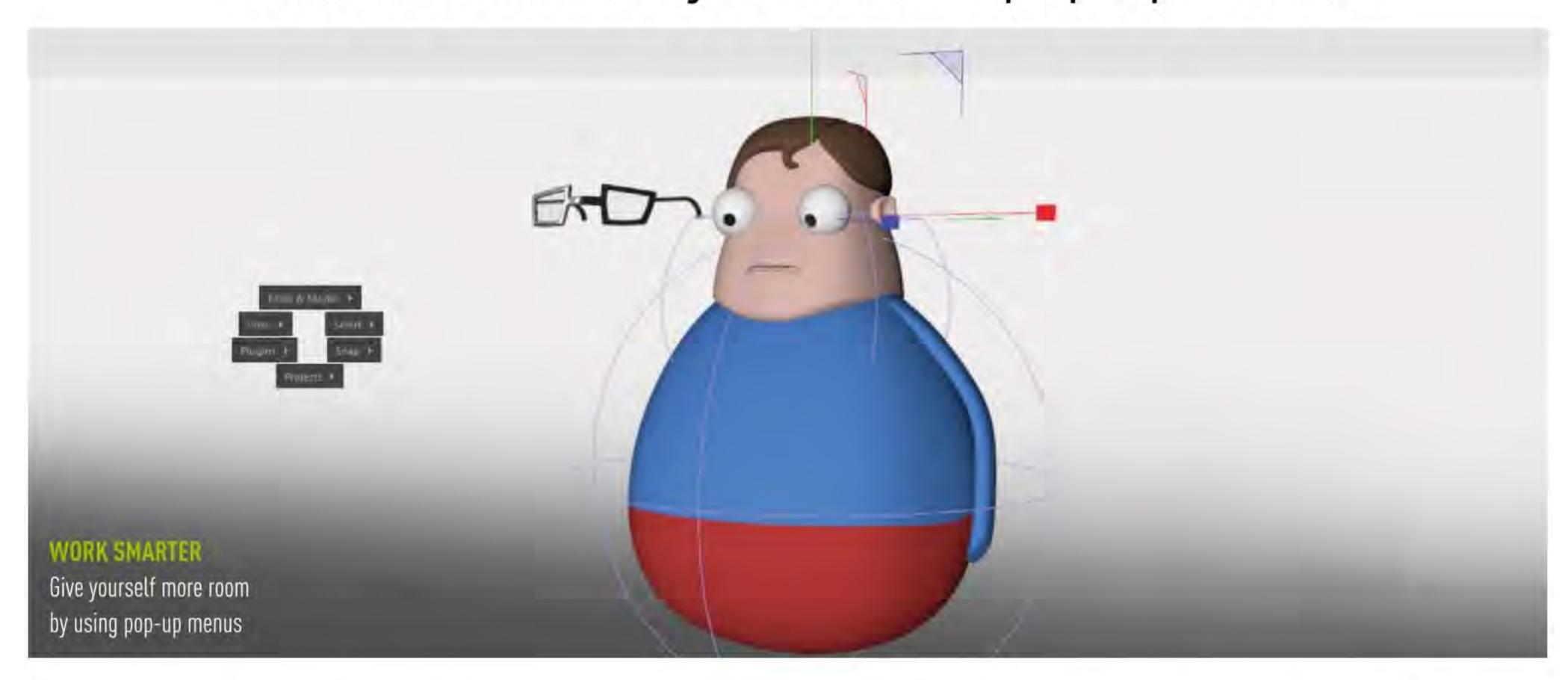
The Height to Normal World Units filter converts a height map to a proportional normal map. The ratio that rules this filter is between a defined Height depth and a set Surface size, both are in world unit (cm).



SOFTWARE: CINEMA 4D

SHORTCUTS: POP-UP MENUS

Make life easier for yourself with pop-up menus



hese Shortcuts pages are all about giving you bite-sized chunks of useful info to help you speed up your workflow and explore your software's options.

Software like Maxon's Cinema 4D are massive. They provide a great number of tools, options and customisation, but that can make for a steeper learning curve than you are comfortable with. With that in mind the developers often create quick-access menus, which can be hugely beneficial, especially for tasks you do less frequently where the mental muscle memory hasn't been solidly created

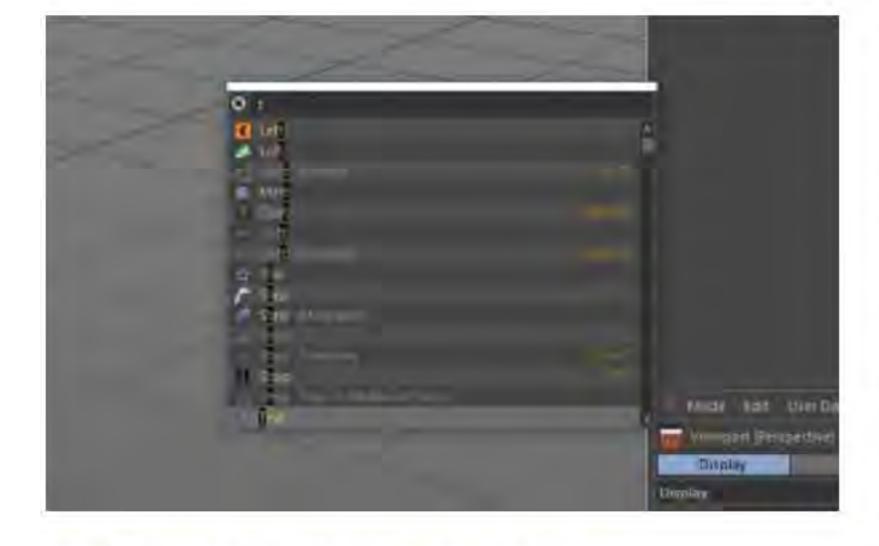
yet. Maxon have added a few of these to Cinema 4D and, although they are great for quickly finding a nested command, they also serve to allow users to create more working room for their viewports and managers. You could conceivably have an interface set up that has no buttons at all, simply relying on keyboard shortcuts and a couple of really useful and powerful pop-up menus to navigate almost everything the software has to offer.

So, if in doubt press the V key or hit Shift+C and you'll get where you need.

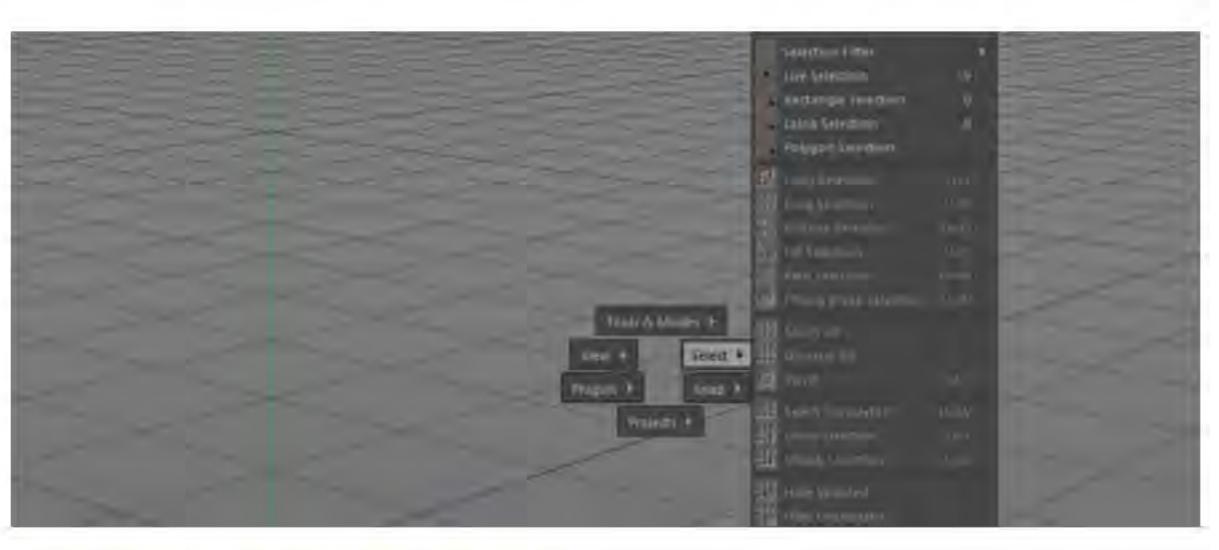


Rob Redman

Rob is a 3D artist
and creative director,
working across TV, film
and print. He runs a
boutique VFX studio.
www.pariahstudios.co.uk



MHAT'S THE PROBLEM?
Memorising commands is hard unless
you use them all day. Hitting Shift+C opens
up a text field. Start typing the command you
want and a list will appear for you to choose
from, opening up the entire application.



7 POPUPS FOR THE WIN

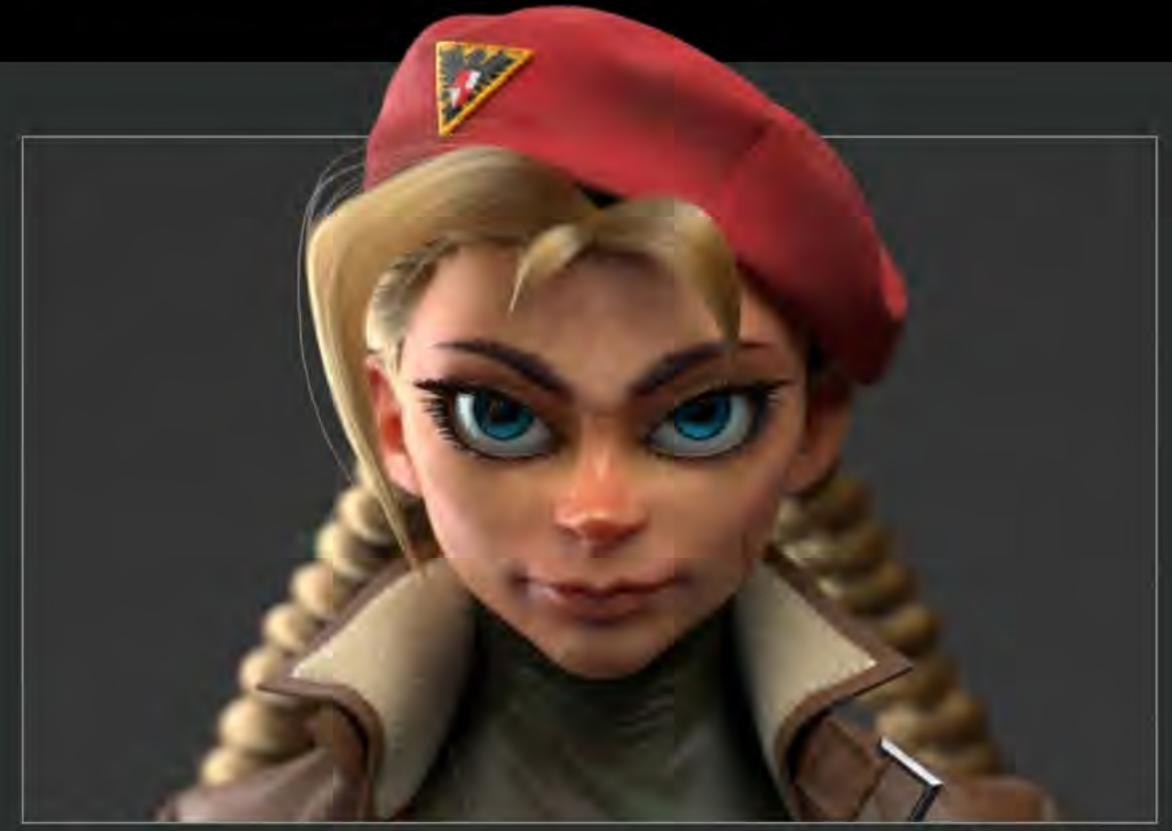
Much of the time spent in Cinema 4D will be used making various selections, navigating between projects and working with plugins or snapping settings. If you hit the V key a radial popup will open, with these common menu sets nested inside. These are the most useful menus.



Whether you're a freelancer, student or have a full-time job, selling your digital products online can be one of the easiest ways to make money on the side.

With the newly released ArtStation Marketplace, some artists have been making enough to earn a living or pay their rent! As the largest community and resource for artists in the industry, what better place to set up your shop?

All it takes is a few clicks and you can have your storefront up and running.



© Olivier Couston

WHAT KIND OF PRODUCTS CAN YOU SELL?



1. Tutorials

Sharing your knowledge and process is a win-win. Make money by helping others learn!



3. Sculpting Brushes

Artists are always looking for tools that can help them achieve a certain effect easier or quicken their process.



2. Base Meshes

Base meshes can be especially useful for students or those just starting out in digital sculpting.

Recent graduate, Colton Orr, now working as a Character Artist at Insomniac Games, uploaded some base meshes he thought would have been useful when he was a student. Even though his following was small, he was able to sell products and grow his following because he had exactly what students were searching for.



4. 3D Assets

No extra work here - you can upload artwork you've already created! Artists look for game ready props and other assets to use but also buy them to see how things are made.



5. Textures & Materials

Whether its a standalone product or a pack for clothing, skin or any kind of environment, textures that are versatile or easy to use are popular on the marketplace.

"I HAD NO IDEA THAT SELLING JUST A FEW CHARACTERS WOULD END UP PAYING MY RENT! AFTER A FEW MONTHS OF SELLING ON THE MARKETPLACE, I CAN SAY IT WAS EASILY ONE OF THE BEST DECISIONS I MADE."

Colton Orr, Character Artist at Insomniac Games

START SELLING YOUR DIGITAL PRODUCTS ON THE ARTSTATION MARKETPLACE TODAY!

INSIGHT.

News and views from around the international CG community



Visual effects supervisor
Stephan Fleet on the set
of *Timeless*, a television
series that tells the
story of a team trying to
foil the plans of a timetravelling criminal

blue screen, maybe 12x12?

VFX DIARY - PART 1

THE SECRETS TO SUCCESSFUL PRE-PROPUCTION

In the first of **3D World**'s special VFX Diary series, visual effects supervisor Stephan Fleet explores the musts of good pre-production

here are several stages to the crafting of great visual effects shots. You might hear about shooting on greenscreen, or the modelling of a digital character, or compositing of CG elements into live-action plates, but there are, in fact, so many more steps in the process.

Many of these steps take place early on, in pre-production – a critical time to plan VFX shots, work out what's needed and what isn't, and ultimately ensure you can meet your deadline and budget.

To help get a handle on just what's involved in bringing visual effects to life, including in pre-production, **3D World** is following the work of experienced television VFX supervisor Stephan Fleet for a series of

practical run-downs of his process. Fleet's credits include *Under the Dome, Iron Fist, Timeless* and the upcoming Amazon show, *The Boys.* In part one of this run-down, he talks about the stages of pre-production, from breaking down a script, budgeting and bidding shots, previs, location scouting and making final plans before the shoot.

SO, WHAT IS PRE-PRODUCTION?

Pre-production, sometimes called 'pre-pro' or 'prep', happens any time leading up to production, which typically means the liveaction shoot. For a standard dramatic one-hour TV show, prep takes place over around eight days. Fleet, who regularly acts as the client-side visual effects supervisor (rather than a supervisor at a specific VFX studio)





is typically involved in pre-production from the very beginning.

"I'm in charge of all things visual effects for my production," Fleet explains. "That means overseeing the breakdown and budgeting of the script, and attending all necessary meetings to discuss concepts, production, dedicated VFX, stunts, special effects, and oftentimes the 'tone' meeting. Then there's the location scouts, which are sometimes early on, with the director or later, with most of the crew. The latter is

a formal scout that takes a day, sometimes even two, known as the 'tech scout'. I also have to interview and hire vendors and work with them on bids."

A large part of Fleet's role in pre-pro is collaborating with other departments to figure out how they are going to design scenes that require visual effects. "This means working with the gaffer and director of photography to, say, design an LED bracelet for Iron Fist's reactive light. Or, it means figuring out what parts of a complex action sequence need to be CG versus practical. Or it could be prevising a mathematically complex greenscreen shoot where a car falls off a cliff."

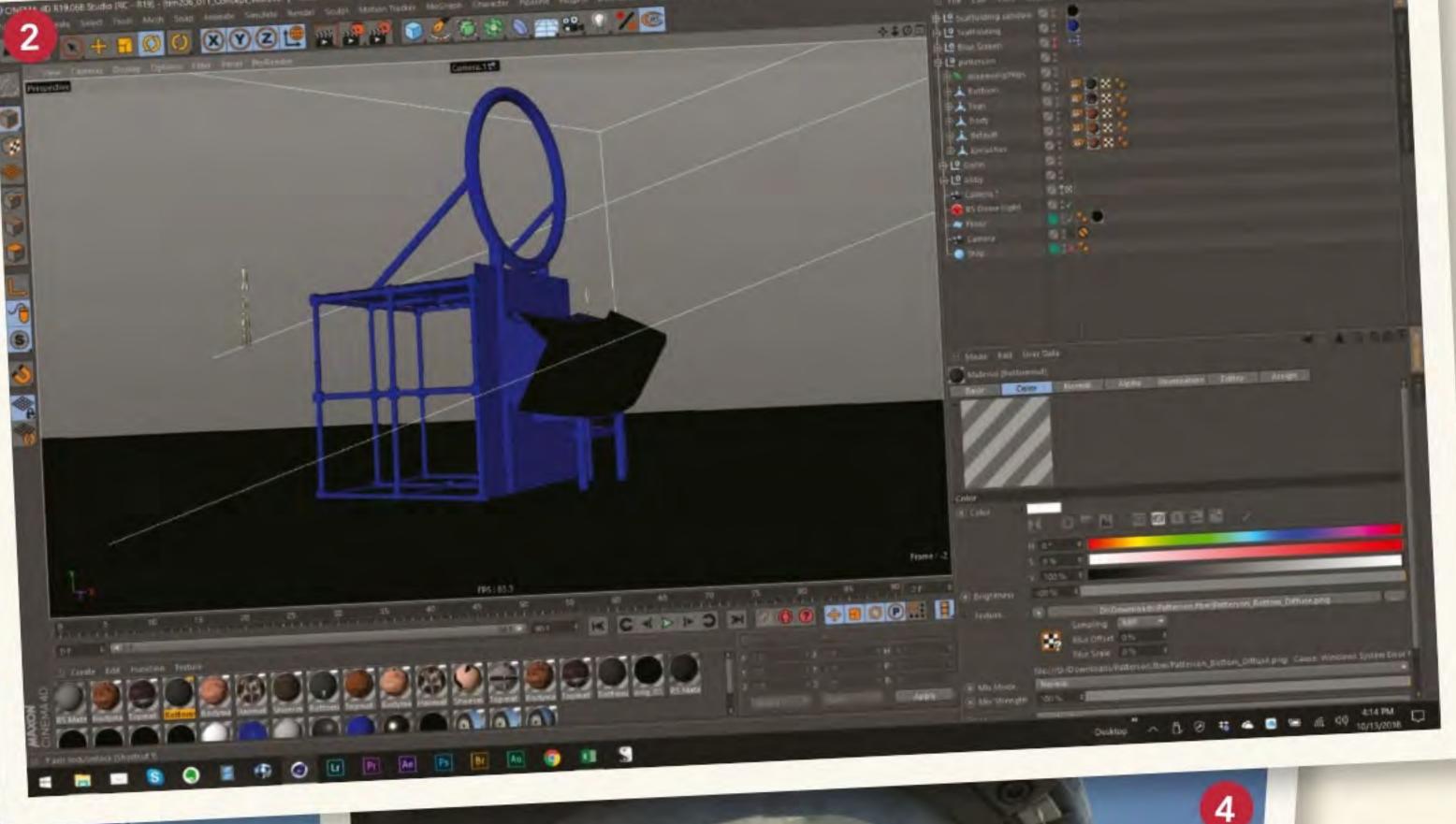
BREAKING DOWN A SCRIPT: THE BEGINNINGS OF VFX

A television show or film typically begins with a script. While it might seem obvious that this is the starting point for working



Breaking down Stephan Fleet's 'concept previs' for a crucial shot in season 2 of Timeless

- 1. Concept: The scene from episode 206 sees the 'Time' team exit their time machine Lifeboat in the countryside. I started with this rough guide (see image).
- **2. Previs:** In Cinema 4D, I built a model of what needed to be constructed on set for the shooting of the scene.
- 3. Bluescreen: The concept previs also helped work out where to position bluescreens and what parts of the blue, faux-Lifeboat were needed on location.
- 4. CG model: The Lifeboat would ultimately be all-CG. This kind of planning helped work out how we were going to shoot what was a very long shot: 54 seconds.
- **5. On set:** Here's what was built for filming on location, enabling the actors to step out of the centre hole.





> out what scenes will require visual effects, things can often change wildly as the show or film progresses. For this reason, Fleet has adopted a specific methodology for breaking down the script in pre-production.

"I read the first draft of a script at least two times," he says. "The first time, I read it for story. I ignore VFX and just try and get lost in the script like a – hopefully – good book. I need to know what happens, why it happens. Identify with the characters and find a reason to want to work on the project.

"The second time I read a script, I highlight potential visual effects. Very seldom do I do anything more than a simple highlight. The page stays clean and the VFX are usually self-evident. Frequent noting just clutters my page and I get lost in my own mess. If a scene has a ton of VFX, usually a lot of the page gets highlighted, so it's easy to see it fast when flipping through the pages."

Fleet uses an iPad Pro with an Apple Pencil to write notes on a digital version of the script (via an app called Scriptation which will let him transfer notes from draft to draft). Often those notes are just one or two words like 'explosion' or 'monitor comp'.

"I tend to come up with different shorthand for different shows," adds Fleet. "For instance, on *Timeless*, monitors were seldom VFX, they were mostly playback. So I highlighted all 'for sure' VFX in green, and all monitor shots in yellow. I also wrote the word 'Ship' near any shot where a time ship travelled back in time. That was a common VFX task and all I needed was that one word to know what was going on. Also, you have far less time as the days go on, so every second saved is a second earned."

BIDDING AND BUDGETING -AND NOT MAKING IT BORING

"I'm going to be straight-up honest here and say that budgeting is my least favourite part of the job," admits Fleet. "On a bigger show, like *The Boys*, right now I have a great VFX producer that helps take care of a lot of it.
But on a smaller pattern show, like when I
did season 2 of *Timeless*, I produce and do all
the budgeting myself."

The script breakdown is really the start of budgeting. Fleet will take his highlights and annotations and put them into an Excel spreadsheet template. The template has entries for page, scene, VFX shot number, description, and what the VFX are. "Each show ends up getting its own slightly unique template, based on its needs," says Fleet. "A complex show may have a column for each vendor's costs, for instance."

Initial budget estimates for VFX shots are, Fleet admits, educated guesses. But a lot of these 'guestimates' are based on experience – over the years Fleet has come to know how much an average monitor composite or muzzle flash costs a VFX vendor to do. "When it comes to a big, abstract, complex shot, I swear a lot of it is putting my finger to the air and trying to guess which way the wind blows. I can also fall back on my years of vendor experience and run some scenarios with their financial templates as a guideline."

There continues to be a bit of back and forth during prep, especially since things almost always change, or if scenes are deleted and other factors come into play, such as tax incentives and foreign location shooting. "Usually," notes Fleet, "we have to lock a budget some time after the production meeting, or at least before we go to camera. And by 'lock', I mean, if we are over budget, we either have to get that overage approved, or we have to find ways to reduce the costs."

"I'M THERE TO CREATIVELY APVISE ON HOW TO MAKE THE BEST SHOW POSSIBLE WITH VFX AS MY PRIMARY, BUT NOT EXCLUSIVE, TOOL"

Visual effects supervisor Stephan Fleet on what he sees as his role during pre-production

Right: Stephan Fleet during a research trip for the pilot show of *Timeless*, in which he visited the site of the Hindenburg explosion in Lakehurst, NJ

Below: Fleet's notes made directly on a previs frame for the Hindenburg crash scene in *Timeless*. The whole sequence was designed in previs in preproduction before filming





THE ART OF PREVIS

Changing or iterating on near-final renders is an expensive proposition, which is why previs has become a major part of pre-production. Sometimes previs also includes 'pitch-vis'. This is where some early exploratory animatics help sell the studio on the idea, or even help in getting the project greenlit. Fleet had direct experience with pitch-vis for *Timeless*.

"I had to prove to Sony that we could film an awesome Hindenburg explosion. I had to go in and pitch to some of the head honchos at the studio on how we were going to get it done. I reached out and hired this great company called CNCPT to previs the scene. I also flew to Lakehurst, New Jersey, for a whirlwind 24-hour trip, where the actual explosion happened, and gathered a ton of research. The studio loved the pitch-vis."

Fleet warns, however, that pitch-vis, and previs, needs to still be prepared within the confines of the real world. "When you're not paying attention to how the camera works, or how the real world works, you can make

Below: Part of Fleet's
VFX breakdown
document for
Timeless

Bottom right: Early concept tests for the interactive lighting required for *Iron Fist*

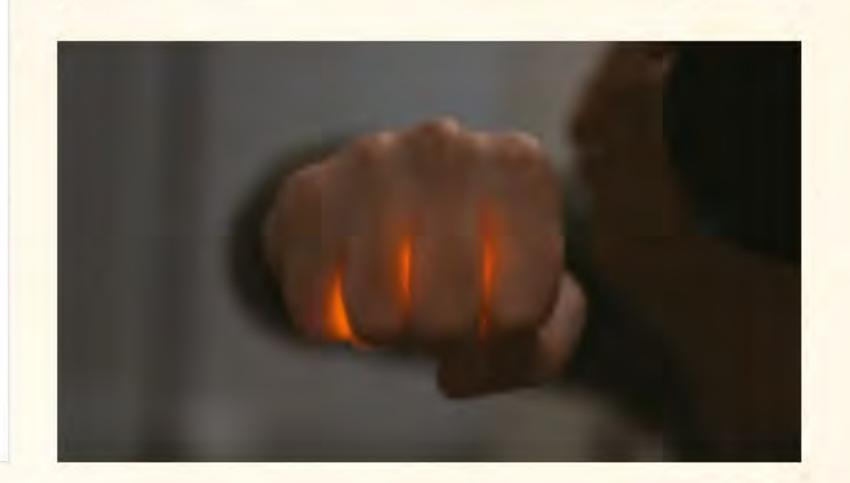
Right: Fleet on set during production on the TV show *Under the Dome*.

Work done in pre-production helps to make the shoot run smoothly



Epis Ver Prepar

#	Shot ID	Pg	Status	Script	VFX Description		
155		19	New	INT. FARMHOUSE - 1918 - DAY BANG! She [Lucy] closes her eyes and SHOOTS HIM DEAD.	Muzzle Flash / Squib b' augmentation		
160		21		EXT. FIELD HOSPITAL - FRANCE - 1918 - DAY sound of mortars exploding nearby, bi-planes buzzing overhead. We should sense the nearby battle in every scene at the Field Hospital.	CG Bi-Plane fly-over	Assume some kind or interesting pan or tracking shot that starts in sky on planes and follows down to ground level establisher. Planes are not fighting or firing guns here	
		25	Omit	EXT. FIELD HOSPITAL - FRANCE - 1918 - DAY when he sees a TANK	Assumes practical	Omitted for VFX in concept meeting	
170		32	Omit	INT. TENT - NIGHT MAC fires at Wyatt but misses	Muzzle Flash enhance	Omitted in Studio Network Draft	1
180		41		EXT. WOODS - NIGHT Carol, Emma and Lucy make their way towards the Mothership	Practical Mothership "half-dome" CG enhance	Assume a handful of shots where we will skin over the half dome set piece with the full Mothership CG asset	3
190		44		EXT. MOTHERSHIP- NIGHT	Practical Mothership "half-dome" CG enhance	Assume a handful of shots where we will skin over the half dome set piece with the full Mothership CG asset	5
200		45		EXT. MOTHERSHIP- NIGHT Woosh! The Mothership dissapears	CG Mothership dissapear	Assume nodal/lock-off clean plate; no mothership set piece	1
210		46	Omit	INT. RITTENHOUSE HQ - NIGHT - ESTABLISHING But they stop what they're doing when the	CG Mothership appear	Omitted in Studio Network Draft	1



things that are impossible to shoot. The same goes for storyboards. Boards often give me anxiety attacks for this same reason. You can drum up \$50 million in VFX on one page or a few drawn frames if you're not careful."

MOTHERSHIP APPEARS. And we -

Fleet recommends considering a dedicated previs studio (there are several), but he is also conscious of the process becoming an early expense, which is why he even sometimes handles his own previs. "I've really started digging Cinema 4D for previs," he says. "I know Maya is the norm, but there are so many accessible models for C4D. SketchUp stuff imports easily. And now with Adobe taking over Mixamo and turning it into Fuse, I can make rigged characters for animation in minutes that look like my cast. Also, if you want to use C4D for previs, I recommend the 'RH Character Tools' plugin. It's cheap and adds controllers to rigged Fuse models with the click of a button. There's also a plugin called Cine Designer that has all kinds of film gear like rigged cranes and camera dollies."

PLANNING AND TESTING

The pre-production period is the time to work out as much as possible, as early as possible. It's the time to plan VFX and the time to budget. Other things can happen

in pre-production too, such as location scouting and, if there's a moment to spare, testing. This might be, say, figuring out shooting methodologies for the VFX shots or testing with props prior to the shoot.

For example, Fleet had a major challenge on *Iron Fist* with the glowing fist of the main character – an effect he wanted to achieve as practically as possible. It was something that was tested before production began.

"Our first pass at it was something that looked like the Nintendo Power Glove wrapped in Christmas tree lights," describes Fleet. "I kinda gulped a little when I saw it, because the profile was so big; not only would it be a full erase-job, but it was bigger than a real hand, meaning we would have to paint back in anything it stacked in front of – notably, Iron Fist's body.

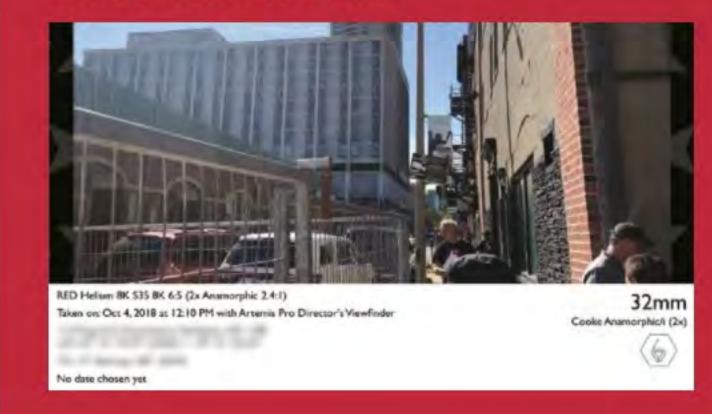
"I stressed over this quite a bit. I did a lot of research on bioluminescent materials. Ultimately, the answer was an LED bracelet on a remote dimmer. The bracelet still allowed us to power up and down the reactive light on his fist, but it was a much smaller piece to erase. It was also positioned below the wrist, which is a fairly rigid area and easier to matchmove and paint out."

Keep an eye on this VFX Diary series to discover more of Stephan Fleet's work

SCOUTING TIPS

Stephan Fleet's advice to scouting locations in pre-production

Take photo reference. I've found that the best camera on a scout is my iPhone using the Artemis viewfinder app. I quickly import the photos into Evernote and write brief shorthand descriptions for what is going on. Often times I measure things so I can model rooms for previs. I also use a Structure Sensor attached to my iPad, along with their little architecture wide-angle lens. For indoor environments, this lets me get quick low-res OBJ scans that I can import into Cinema 4D to quickly model stuff to scale.



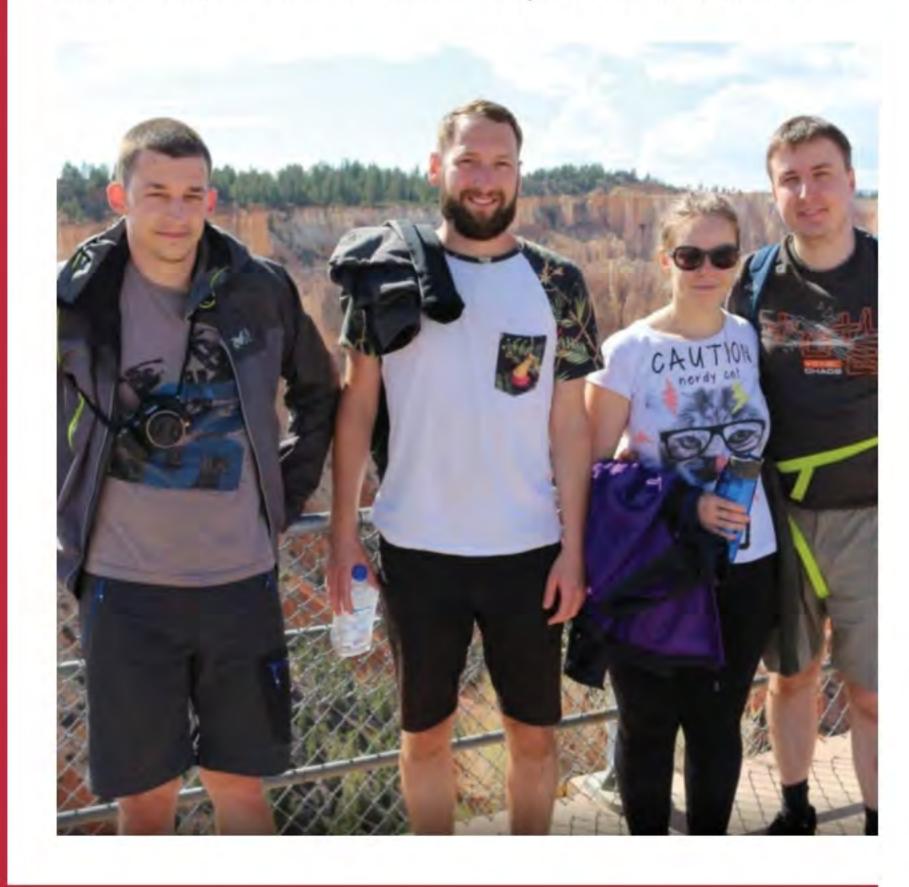
INDUSTRY

Corona - what's the latest?

Whilst working on the denoiser, the Corona team found ways to improve render times and results

Corona has become a fast staple for archviz and exterior renders due to its render speed and easy workflow

Left to right: Pavel Ševěcek – 3ds Max developer; Nikola Tomšu – C4D team lead and developer; Zdenka Fojtíková – office manager; Ondra Karlik – founder and lead developer of Corona Renderer



THE CPU VS GPU DEBATE

Will Corona ever go GPU?

One of the most-asked questions is whether or not Corona will support GPU rendering in the future. Ondra did not stray far from the same response as the one on their webpages: while there are benefits in using GPUs for real-time and VR rendering, there are many issues with how a CPU and a GPU handle data. A GPU will always have bottlenecks connected to available VRAM and parallel processing, which can manifest for users in many ways – from Substance procedurals not working or slowing down, to limited map and plugin support.

To turn Corona into a GPU renderer would mean a lot of time spent on exploration, rewrites and testing, and in the mean time, they'd risk losing sight of what they are best at, which just isn't feasible right now – and won't be, unless there are significant changes on the GPU front. Instead, the Corona team will implement GPU support in the future, but for things a GPU is really good for – like post-processing elements such as bloom and glare, as well as denoising. This is easier to implement, as the operations that are needed for this kind of thing are compatible with how a GPU works, and can hence easily be sent over for processing.

So right now, Corona will stay a solid CPU renderer with GPU options, but of course, one can never say never.







EXCLUSIVE REPORT

CORONA – WHAT'S THE LATEST?

It's been a little over a year since the Chaos Group merger, and Corona Renderer is still going strong. We find out more about its journey...

or the Render Legion gang, it's been an intense five years: from the Corona Alphas in '13 and '14, to last year's Chaos Group buyout and this year's Corona 2.0 for 3ds Max and C4D releases. So we asked Ondra Karlik, founder and main developer of Corona, how it's been going. To answer that question, he began with a detour into the first parts of Corona's journey:

"When we started Corona, especially after we went live, we learned some hard lessons while working hard to stay afloat. We learned that there is a fine balance between delegating and giving up control over your work, as well that if you want something done right, you may have to do it yourself.

"We also learned one of the most important software development lessons around: adding more developers does not necessarily mean a better or faster output of your product. These experiences make it retrospectively easy to see we were way too fast on our track in the beginning. We've slowed down now, and I feel we're currently on a much better footing to create the renderer we want to".

This of course raises the question about what effect the Chaos Group buyout has had on the Corona team.

"Well, Corona
is not going to be
killed and stripped
for parts, that's for
sure. To be honest,
there haven't been too
many changes. For me
personally, it's been

adjusting to not owning the company. For the developers there haven't been that many, either: there have been no forced changes, we communicate well, and the best and biggest change is that we can now look at reference implementations from V-Ray. It's probably the office staff who've been hit the hardest, as they had to adjust to how Chaos Group do things."

Ondra continues: "As an example, we had a really successful hackathon with the V-Ray team this summer. You can see the results of this in our recent builds and releases, like the new V-Ray compatibility, Corona Scatter in V-Ray, the Corona denoiser into V-Ray, as well as bloom, glare, Corona Scatter and volumetric render improvements. We also put more work into our denoiser. This was actually a bit of a task - deciding what to denoise and not, because if you add all kinds of channels, it just won't work well. Where other denoisers usually work with the rendered image, we decided to give the denoiser more data to work with. We actually discovered during development of making denoising happen on CPU that our optimisations improved render times and results, and we got good feedback on this."

So now that trade-show season is over and the dust from the buyout has settled for real, what's in store for Corona in the near future?

"On the top of our list is even better compatibility with iToo's products as well as OSL support. We're also aiming to improve caustics, a tone mapping rework, Cryptomatte, memory optimisations, as well as adaptive light sampling and Render Element visibility in reflections/refractions.

"This really is a hard question to answer, as we get so many requests, and sometimes

it's hard to figure what users want, contra what they need. We even had an incident where users hijacked the voting polls for Modo and/or Rhino, which made it even more difficult, but we take all suggestions

or ideas into consideration – we may just be careful with the order of accepting or implementing them, as a lot of components are interdependent. But all in all, the future for Corona looks pretty rosy. Now, if we could only get some more Czech developers for the team, things would be almost perfect!"

Keep up with the latest Corona news at corona-renderer.com

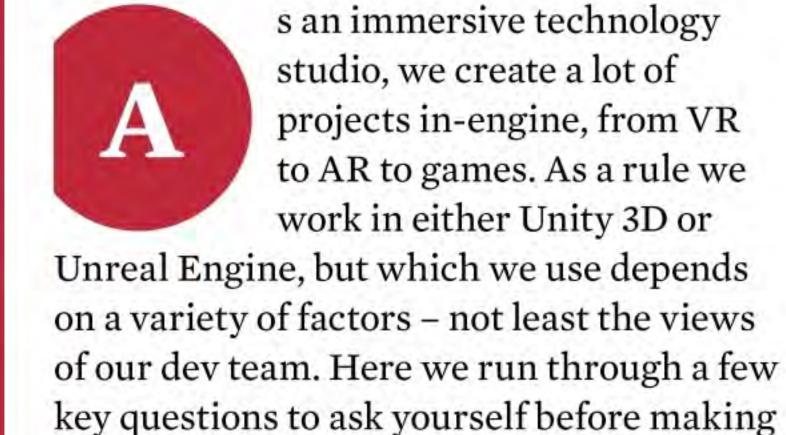
"WE LEARNED THERE IS A
FINE BALANCE BETWEEN
DELEGATING AND GIVING UP
CONTROL OVER YOUR WORK"

Ondra Karlik, founder and main developer



UNITY VERSUS UNREAL: CHOOSING YOUR GAME ENGINE

James Burrows, Wayne Jackson and Marcell Rideg of Immersive Studios discuss the considerations you need to make when choosing between the two leading game engines



WHAT LEVEL OF VISUALS ARE YOU AFTER?

your choice.

One of the main differentiators is the quality of visuals. Unreal offers high-fidelity visuals straight out of the box, whereas Unity – while still able to produce high-quality visuals – takes a lot more work to get your assets looking close to the same level as Unreal. And even then, it won't produce quite the same quality. It's for this reason that you'll find Unreal used more on big games and productions from large studios – and why we chose it to create a VR configurator for the hypercar Brabham BT62. So, if you want as close to photorealistic assets as possible, it's quicker and easier to achieve this with Unreal.

WHAT DEVICE IS YOUR PROJECT AIMED AT?

If you're looking to create a project to run on lower-powered devices, such as mobile phones, then the high processing power demanded by Unreal isn't necessarily for you. This is where Unity really comes into its own. Originally designed to run on devices like consoles and phones, Unity enables you to create complex projects for low-end devices without requiring such a powerful PC setup as Unreal. If, on the other hand, you're creating an experience for high-end devices then either Unity or Unreal will set you right. But that also depends on...

WHAT'S YOUR TEAM SIZE?

The consensus amongst the collective experience of the Immersive dev team is that to get the very best out of Unreal, you need a large and specialist team that's dedicated to different parts of the process – for example someone dedicated just to particles or someone just to shaders. Unity, on the other hand, is much easier for developers to get to grips with straight away – making it a good choice for one-man bands and smaller teams to create an effective experience. Its asset

store is also significantly bigger, making it simpler to populate your game or experience if you don't have a massive team.

ARE YOU A DEVELOPER OR A VISUAL ARTIST?

There's no doubt about it, this seems to affect your preference. Our developers prefer Unity, but our visual artists opt for Unreal – and this is purely down to the difference in visuals. Both game engines offer the same sort of functionality and capability, just packaged in different ways. For a while now, the lines differentiating the two have started to blur as Unreal - starting out as an AAA game engine - aims to make itself more accessible for smaller teams and experiences, while Unity - originally preferred by indie studios for simple games and experiences - continues to work its way up to the top by adding pro-level features. The main difference is visual quality and your target platform – but we think it won't be long until both engines reach a similar level in both respects. In which case, soon it'll simply be a case of personal preference.

Get in touch at info@immersivevr.

co.uk or visit weareimmersive.co.uk

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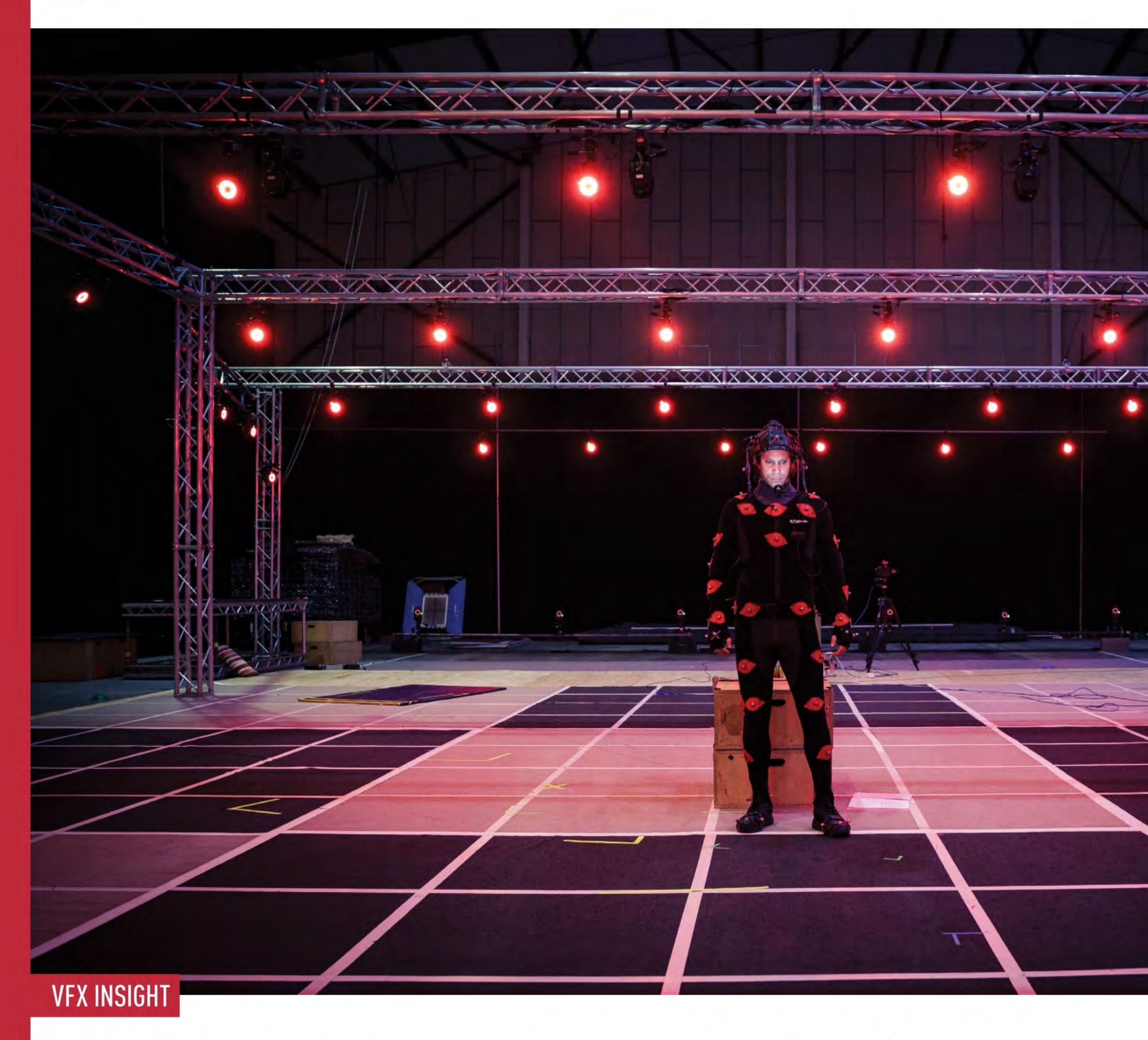
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TOP TALKS WORKSHOPS PORTFOLIO REVIEWS ASK AN ARTIST RECRUITMENT NETWORKING



HISTORY IN MOTION

Motion and performance-capture veterans Audiomotion discuss 21 years in the business

he rural surroundings of
Wheatley, a small village
just outside Oxford, are not
where you might expect to
find Europe's largest motioncapture stage. But that's exactly where
3D World has headed to sit down with
Audiomotion's managing director Brian
Mitchell and sales director Philip Morris.
The pair have taken a break from a busy

film shoot to show us around their state-ofthe-art facility. "We've got the two stages currently set up for motion and performance capture. The bigger space has a capture volume of 20 metres by 12, which is a pretty good size for anyone," explains Mitchell. The main stage's camera rig is motorised, so Mitchell and the team can change the height and capture volume according to their clients' needs. In total,

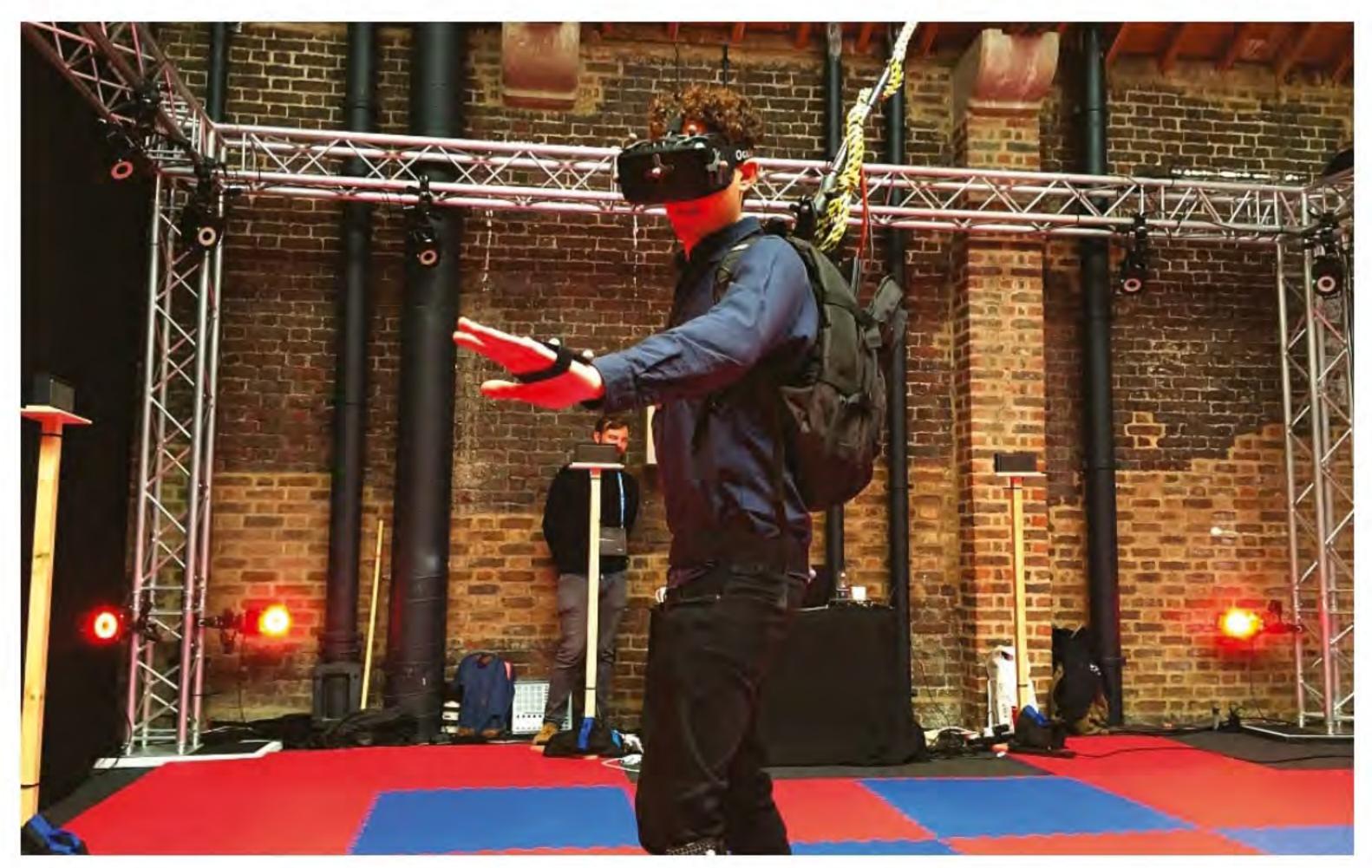
the impressive facility houses 180 Vicon cameras and is the largest capture area outside of North America.

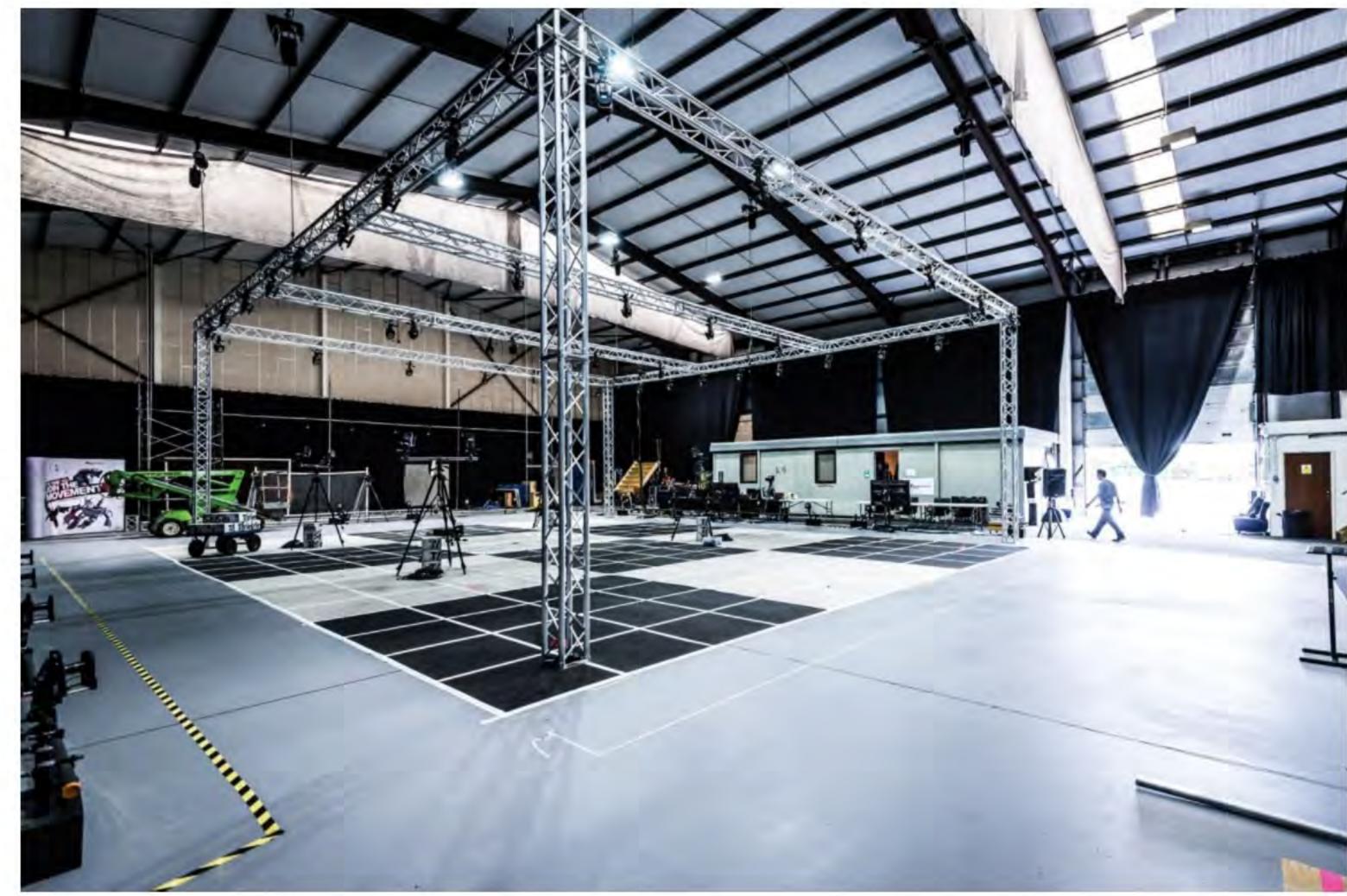
Audiomotion was established as part of a group of developers owned by Geoff Brown, one of the game industry's founding fathers, to provide audio and motion capture services to the rest of the group, Silicon Dreams, Attention to Detail and Pivotal Games. "That's how the name came about,"





Left: Morris has a varied background, working in the travel industry before joining Nintendo, Intel and Apple Below: A still from Audiomotion's VR experience with Visualise from the WIRED 2015 event Bottom: Audiomotion also work with developers on apps, including First Touch who created the popular Score! app





adds Mitchell. "Obviously it doesn't work for us quite so well now that we mainly do motion capture, although we still record final audio and guide tracks when needed."

That name quickly earned a reputation for exceptional motion and performance capture. "It was set up separate from the rest of the developers to offer our services out externally as well as service the internal companies," says Mitchell. Over the next few years they would work on a host of sports titles including Olympics tie-in games, and Ridley Scott's historical epic, *Gladiator*.

It was the studio's great reputation that convinced sales director Philip Morris that he'd made a good decision when he joined six months ago. "I joined Audiomotion



"WE'LL WORK WITH CLIENTS ON THEIR SCENARIOS, RIGS AND SHOT LISTS ALL IN ADVANCE"

Philip Morris, sales director, Audiomotion

and one of the first things I did was book my flight to GDC," he laughs. "Everyone spoke about us in such a positive light, and told me how smoothly their shoot went or how they'd heard someone else came to us and was really pleased. It was a great first impression to have, at such a prestigious event. My role now is really to build on that and open some new doors – which is made a thousand times easier by the fact that we've already got a great reputation."

Despite having their origins in the world of gaming, the last two decades have seen Audiomotion become an increasing presence in Hollywood cinema. After capturing horses for Ridley Scott's *Exodus: Gods and Kings* and creating an undead horde for *World War Z*, their biggest project yet came in 2016, with Steven Spielberg's *Ready Player One*. Mitchell continues: "We supplied all the cameras, crew, and loads of freelancers for that film. We would then take what we

WEIRD AND WONDERFUL MOCAP

Audiomotion don't just provide for the entertainment industry. Brian Mitchell talks us through some of their more left-field projects

"We helped the National Fire Chiefs Council (NFCC) with some research," recalls Mitchell, when asked if Audiomotion have had any less-conventional clients. "It was researching the procedure for extracting someone from a crashed car. We put our cameras inside a car then had somebody suited up in the driver's seat while a fire crew then went through the whole procedure. That data was then used to analyse the effects that procedure has on the body."

Since much of their technology has its origin in the medical field, Audiomotion have contributed to various Oxford University studies – including a head trauma study that involved repeatedly throwing a crash test dummy down some stairs. It's clear that nothing is too unusual for Mitchell and his team: "We've mocapped a cat before, a dog, some horses. Introducing children into the mix always brings its own challenges too."



> captured through MotionBuilder, Maya and Unity. So we'd do the whole pipeline in the same day, it was pretty full-on." It's a challenge that clearly paid off, as they would go on to earn a credit on *Star Wars: The Last Jedi*, a major box to tick off for Mitchell and his team.

Not content with working on Hollywood films and best-selling video games,
Audiomotion picked up a Guinness World Record in 2015, for the most people motion-captured in real time. "We got a troupe of hip-hop dancers to have a dance off. The record stands at 19 people, it would've been 20 but one of the guys took their mocap hat off, which basically took the character's head off."

So what is the key to Audiomotion's success? For Morris it's their collaborative approach to dealing with clients. "We work with each individual client to create something bespoke," he says. This means that the studio forgo having a default price list, as Morris explains: "As much knowledge

"NOT ONLY CAN WE OFFER THE SERVICE, BUT IT'S ALMOST LIKE A CONSULTANCY – WE CAN ADVISE EXACTLY WHICH WAY TO GO WITH SOMETHING"

Brian Mitchell, managing director, Audiomotion

as we can get on the project beforehand will help us tailor the shoot to your requirements. Because if we go ahead and give a quote without finding out everything we need to know then something could go wrong. We'll work with clients on their scenarios, rigs and shot lists all in advance."

Mitchell believes that their continued success is largely due to the expertise they've acquired over a long and varied career. "Not only can we offer the service, but it's almost like a consultancy – we can advise exactly which way to go with something." This often involves sitting down with creators long before production starts, to iron out exactly how something will be achieved.

Even after 21 years in the game, there's still plenty for Audiomotion to aspire to. Recently they announced a partnership with Rokoko, making their assets available on Unity's Asset Store. "We'll keep adding to it as we go along," promises Morris, "it demonstrates our ability to adapt and the fact we're open to new ideas."

Elsewhere Mitchell is turning his attention to the possibilities of virtual production. "Mixed reality, live action, CG, game engine, all that integration is like all the planets are lining up at once. We'll be getting stuck into it and seeing how far it can go," he promises.

Find out more about the studio's work at www.audiomotion.com





Left: Liam Neeson spent two weeks at Audiomotion's headquarters capturing his performance as the monster in A Monster Calls

Below: Audiomotion captured horses and chariots for Ridley Scott's 2014 film Exodus: Gods and Kings

Bottom: Mitchell says that most of Audiomotion's work is done in-house, with around 20 or 30 per cent shot on location











Steve Jarratt
Steve is a freelance
tech journalist and CG
artist, with an unhealthy
addiction to 3D apps
and plugins.

www.wikipedia.org/wiki/ Steve Jarratt

FEATURES

Geometry nodes for Displacement, Flakes and Bubbles

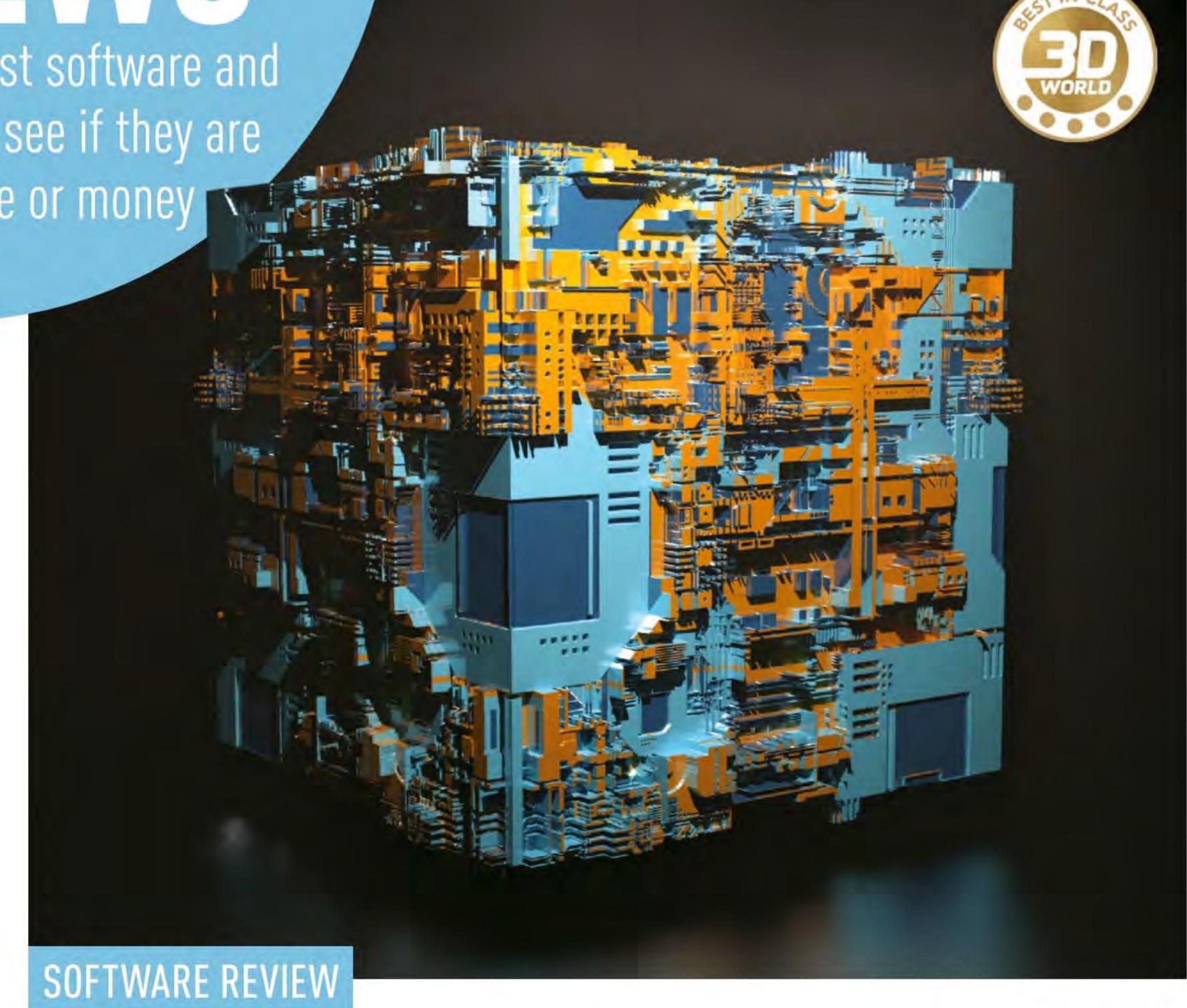
Volume and Cutaway materials

Multi-layer optics

Image-editing toolset

KEYSHOT CLOUD

Luxion's online repository
of assets is now accessible
directly from within
KeyShot 8. This collection
of materials, environments,
backplates and textures is
an invaluable resource, and
among our favourites are
the worn metal materials,
which add scuffs, scratches
and edge wear by mesh
curvature, plus a wealth of
photography studio-style
HDRIs for easy lighting of
product shots.



KeyShot 8

KeyShot's geometry node uses an image to displace a mesh surface. It's nothing new, but it's very well implemented and makes really clean meshes

PRICE Pro version: £1,534 (\$1,995, €1,749) | HD version: £765 (\$995, €873)

COMPANY Luxion

WEBSITE www.keyshot.com

e've watched with interest how KeyShot has evolved since first looking at version 3 back in 2012. Version 8 represents one of the biggest updates in its history, bringing a range of new tools, materials and shaders to make your renders more varied and more realistic than ever.

The key feature for 3D generalists will be the new geometry node types, which add Displacement, Flakes and Bubbles. Displacement works similarly to most renderers, using a greyscale texture to generate surface detail that would be difficult to model or sculpt. KeyShot's implementation is excellent, producing really fine levels of

displacement. It's not instant – there's a bit of calculation time while KeyShot generates the necessary geometry, but once done, there's seemingly no real hit on navigation or render times.

To use the Flakes node, ideally you should duplicate your mesh then apply the geometry node to one, and a transparent material to the other. This lets you create glass or plastics with sparkling metal flakes or spherical beads inside. The Bubbles node works with a single material to add realistic bubbles, which is ideal for making fizzy drinks, clear gels, that kind of thing. You can, of course, use these nodes on their own for strange

and dramatic results, such as a mesh made entirely of flakes or tiny spheres.

Another important addition is the Scattering Medium, which can be used for rendering smoke and fog, and works nicely with the new Spotlight to create visible light rays. You can render OpenVDB files or simply apply it to a mesh for more abstract imagery. The end results are terrific, but the Scattering Medium can be one of the slowest elements to render, so use it with caution (or a lot of CPU cores). It's also one of the things that make us think KeyShot would benefit from a denoising solution, especially with some of its new materials



Left: KeyShot's not just for product shots any more.
The addition of mesh displacement opens up a world of opportunities

Below (left): The geometry nodes can be used to create things like metallic flakes or bubbles within an existing mesh

Below (right): By applying the Cutaway material to a mesh, you can remove parts of your object and, in true engineering style, have the sliced edges painted red for clarity





being such render hogs. The app always gets you to 90-95% of the final image very quickly, but there's usually a wait for certain effects to resolve. A denoising function or adaptive sampling would reduce that final waiting time.

Cutaway feature uses a
Boolean function to remove
sections of a mesh, revealing
the details within. You simply
apply the Cutaway material to
an object, such as a cube or
sphere, and have it intersect
with your mesh. The sliced
edges are shaded to highlight
the effect, and you can exclude
specific objects, enabling you
to cut through a casing, for
example, and leave the gearing
inside intact. Overall, it's dead

easy to apply and the results are very clean. There are a few caveats, in that it doesn't work well with glass and objects need to be solid, but it's a really useful function and one that product designers and engineers will love. (And it can also be used as a last-minute modelling tool in a pinch, if you need to remove part of a model or maybe add some details.)

Among the numerous workflow improvements, you now get built-in image-editing tools, with curves, tone mapping and colour adjustments. This is a simple but hugely convenient feature, which enables you to refine the look of your image – as it renders – without endless

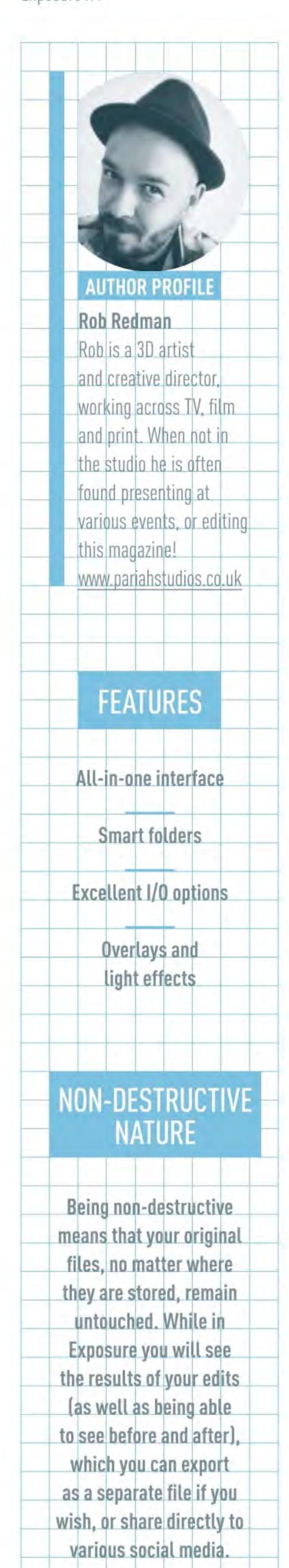
round-trips to an image editor. There's also new multi-layered optics, if realistic glass is your thing, support for hex colour codes, gITF/GLB export, and improvements to KeyShot's Studios and Configurator.

All in all, KeyShot 8 is a really impressive update. Some things – such as displacement mapping – are a bit overdue, but they're here now and very nicely implemented, with tweaks and enhancements already queued up for version 8.1. It's a shame that KeyShot's high cost and reputation as a niche renderer prevents broader adoption, because once you try it, there's no going back. Its ability to deal with multi-million-polygon scenes, and the sheer ease with which you can experiment with materials and lighting, make it a joy to use – and actually rather addictive. It also helps that the end results are usually pretty gorgeous, too. If you're lucky enough to use KeyShot for a living, then your job's about to get a whole lot easier.

KeyShot 8 is a huge update, bringing something for everyone. It's still primarily a product visualisation tool, but these new features see it creep ever further into the realms of illustration, architecture and even VFX. It's still expensive – especially if you want the 'Pro' features – but for current owners this update is definitely worth it.

VERDICT







Exposure X4



PRICE \$149 DEVELOPER Alien Skin WEBSITE www.alienskin.com

render is almost never the final step in an image's life. Often there will be grading to do, or compositing, or both. Sometimes you may simply need to export a few versions for different end uses, such as adding to a portfolio, sending to a client or sharing on social media. It's tempting to think that the best course of action is to use multiple applications to do all this, when in actual fact there is one piece of software that could handle the heavy lifting.

Exposure X4 is an image management and editing solution that takes many of these tasks and rolls them into

a creative workflow that is truly elegant and logical. Within one intuitive interface you can complete everything from import to colour correction and export. Yes it may look familiar to those who use Lightroom but it differs in a few key areas. Firstly it never touches or duplicates your images. It adds metadata to store edits, leaving your image untouched on your drive, saving space and meaning you can pass on edits to another person more easily.

There are no 'rooms' here, as everything takes place in one space. You can import a location (the file location not the actual image) and save

various locations, like external drives, as a bookmark for ease of navigation. There are endless view options, as well as rating and flagging tools, to help you define searches and categorise your library, viewing either singly or in multiples, along with before and after options, side by sides, preview edits and presets.

Which brings us to one of the main elements of Exposure: its preset library. Whether you are working with photos or renders, these presets offer a host of different looks and feels, from subtle to extreme, including many film simulation modes that can really help to

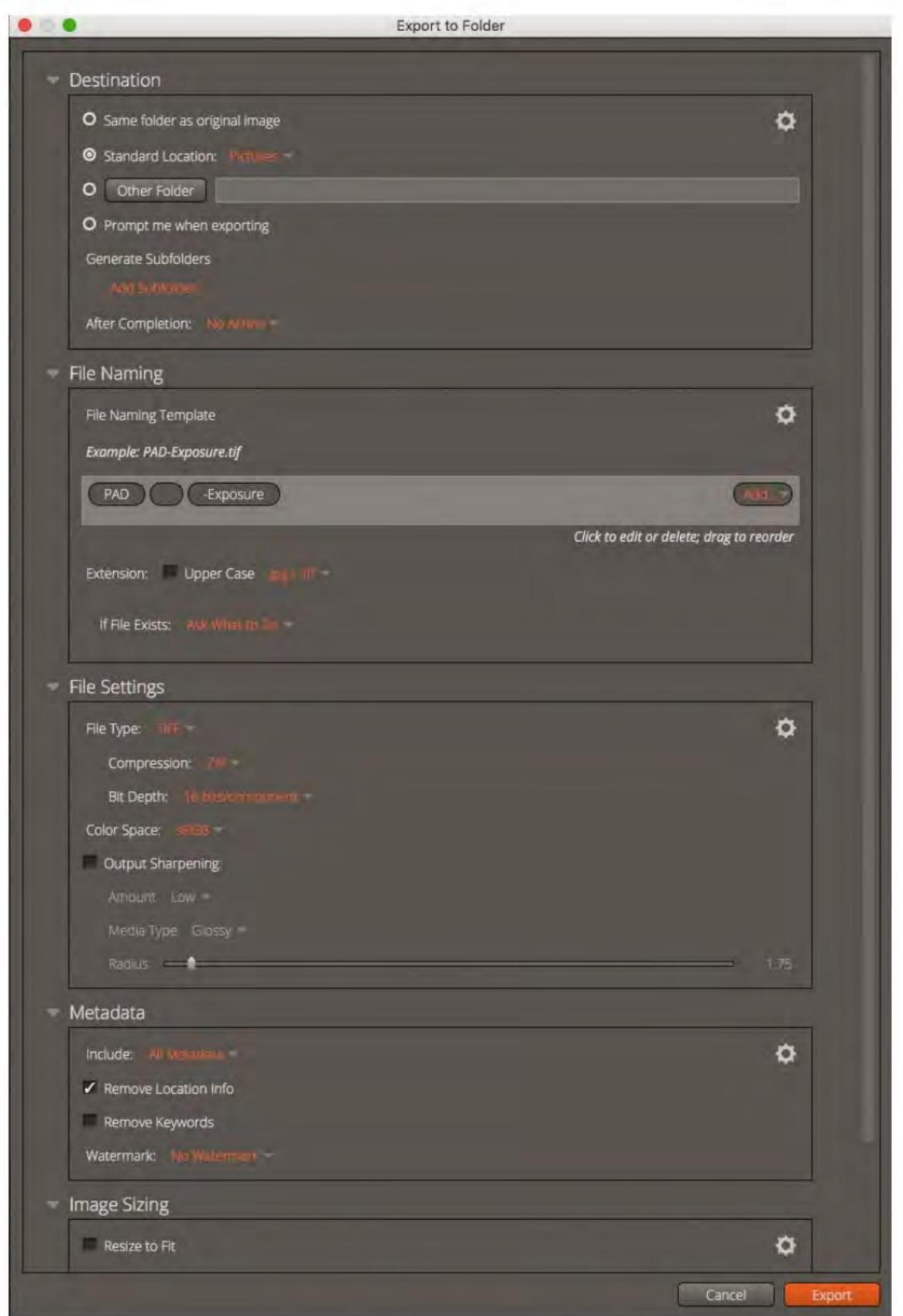


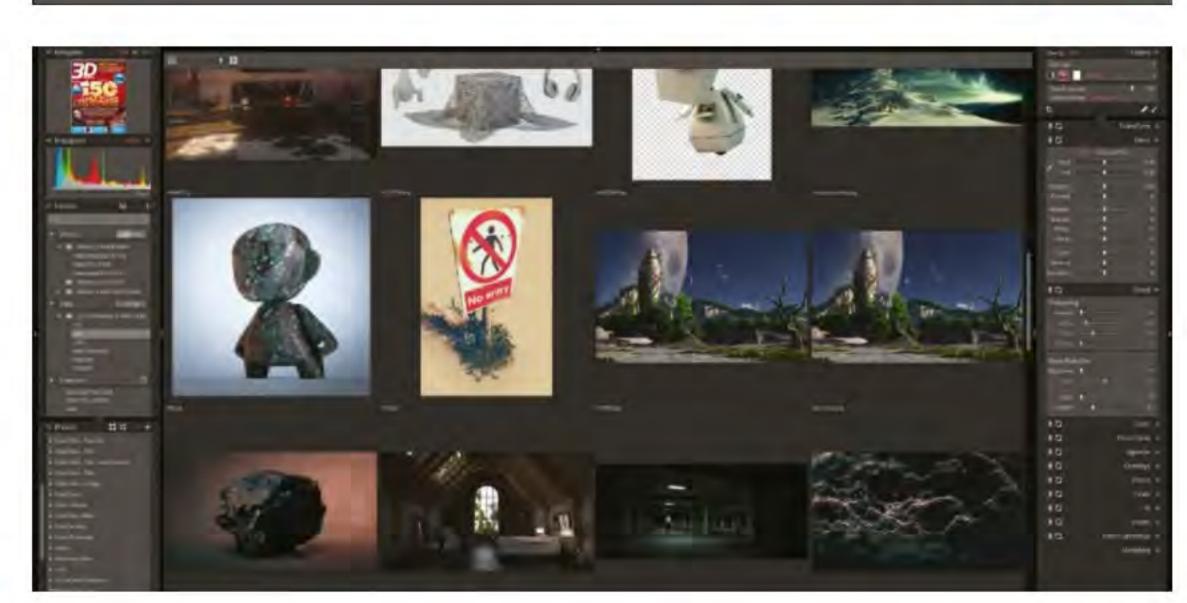
Below (top): The interface of Exposure X4 is clean and intuitive, for a gentle learning curve and ease of ongoing use

Below (middle): Exporting from Exposure X4 is easy, with options broken down into logical attributes, as well as a preset system

Bottom: Finding and viewing images is simple, with many qualifiers to aid searches, from colour codes, to ratings and flags







make a clean and crisp render feel more organic, with lovely tone falloffs and film responses. There are a bunch of more over-the-top choices but every one is made from the editing options Exposure offers, making them easy to dial in exactly as needed. Better yet is that Exposure offers a full layer system, enabling you to add stacked edits, balancing them easily with layer opacity.

On the right side is the manual editing panel, which houses familiar slider sets such as hue and saturation and channel mixers, but also some more expressive options like overlays, borders and bokeh effects, making Exposure a really creative tool and one that can take a simple image and get the best from it.

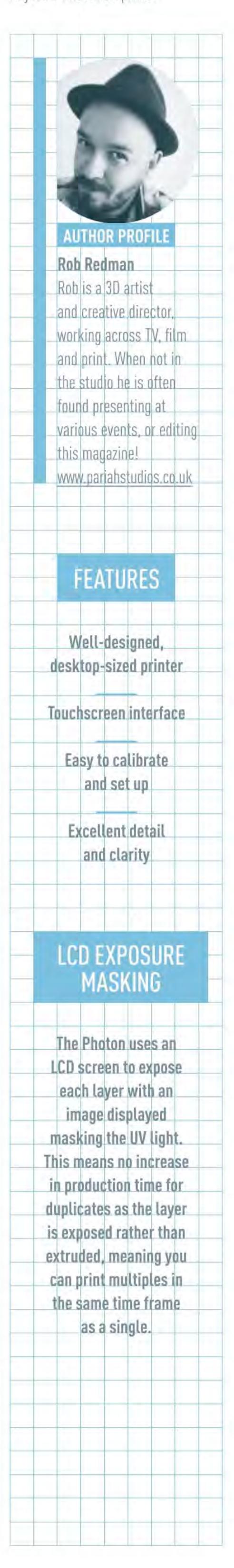
Staying organised with an ever-increasing portfolio can be tricky for even the most diligent of artists, so any help is welcome. Pleasingly Exposure assists in this area too

with smart collections, which can be set up using various qualifiers, from simple ratings to metadata or keywords. This makes hunting for any image quick and easy.

Exposure X4 is all about doing things efficiently and that really shines through in use. The learning curve is almost non-existent, with everything laid out neatly and the UI helps rather than hinders. The editing process is familiar but slicker and more fluid than other options, even on older machines with less processing power behind them, and even when working with large RAW files from the latest cameras or renders of a larger resolution and colour depth.

Exposure X4 is simply the best all-in-one solution for managing and editing images in a non-destructive way, with an elegant interface and logical processes.

VERDICT



HARDWARE REVIEW

Anycubic Photon 3D printer

RICE £439 DEVELOPER Anycubic

WEBSITE www.anycubic3d.com

A neat, nicely built machine, the Photon is a fantastic option for those looking for a resin printer

here are a number of different types of technology used for 3D printing, but in the last couple of years it looks to be LCD exposure masking that has changed the balance between quality and cost, bringing it to levels the keen enthusiast can afford. Anycubic are leading this trend, with their Photon machine growing in popularity as various YouTubers spread the word, especially for those looking for fine detail in areas such as war-game miniatures and terrain, dental printing and other work where fine definition and clarity are essential.

The Photon comes well packaged and needs almost no work to get up and running. A simple door handle needs to be screwed on (it's separate to prevent damage in transit), then a quick calibration and bed levelling process are needed, which takes just a few minutes.

The build quality is excellent, with well-machined, anodised aluminium components in a neat desktop case, with adjustable feet and UV-resistant windows that stop your resin curing between prints.

Which brings us to the print method. This printer uses liquid resin that cures under UV light exposure to produce models. This makes for smoothly finished models, with less visible strata from the process, but it does come with some downsides. Firstly the fumes are less than pleasant and I would strongly advise using in a well-ventilated area.

I actually printed an adapter for mine and use a length of 4-inch hose to vent out of a window.

There is also the finishing process to be aware of. You'll need a space to wash off excess resin, clean the model and then cure fully. This can be done in sunlight or you could use a UV lamp, but either way you'll need a 'wet' area and a supply of gloves, isopropyl alcohol and suitable containers. That said the process isn't difficult, so don't be too put off.

In fact, it's fair to say that it's a small price to pay for the results, which are some of the best you'll see at even three times the cost. Once you have narrowed down your layer exposure settings, which take a little trial and error, you will be printing with excellent results. Some of the parts this machine is capable of are so clean and smooth they could be mass-produced injection moulded, rather than printed at home. Details are exceptional for a device of this type and although the build volume isn't huge at 115mm x 65mm x 155mm, it's plenty for a resin printer and you can get creative

with your layouts. Just watch the cost of resin, as it fluctuates almost weekly.

Lastly the slicing software is good too. It may not be the prettiest interface and lacks in finesse, but the slicing operations are fast and the support options are good too and work well.

It's clear to see the quality available at this price point is far improved over the last few years and the Photon is ahead of the game, with a solidly built machine that delivers, consistently.

VERDICT





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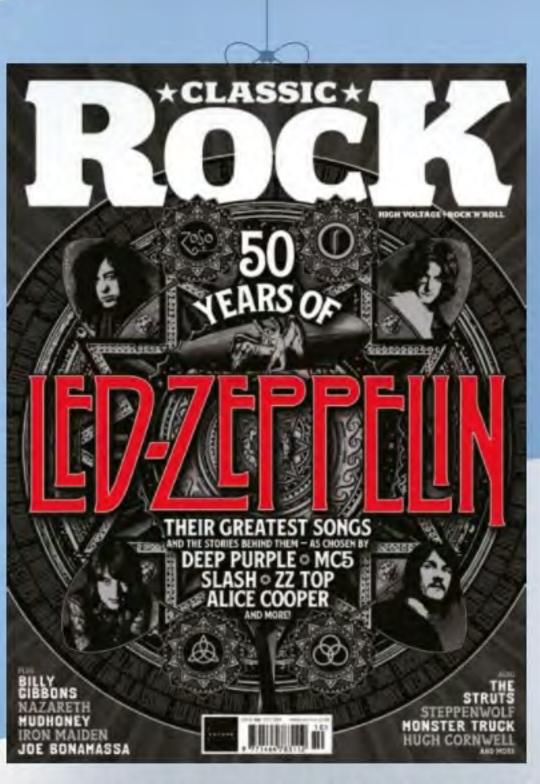


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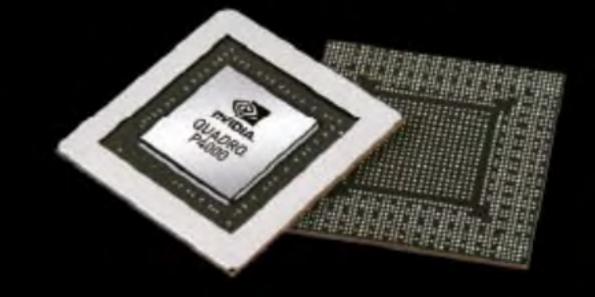


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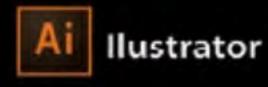




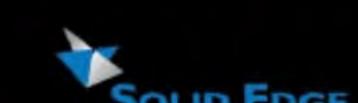


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